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Commercial Fisheries Abstracts

a monthly summary of important developments for the fishery industries

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FISH & WILDLIFE SERVICE

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Vol. 13 No. 5 May 1960

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U.S. Department of the Interior
Washington D.C.

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FRED A. SEATON, SECRETARY

FISH AND WILDLIFE SERVICE
ARNIE J. SUOMELA, COMMISSIONER

Commercial Fisheries Abstracts

DIVISION OF INDUSTRIAL RESEARCH AND SERVICES
BUREAU OF COMMERCIAL FISHERIES

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Following is a brief outline of this filing system. The numbers apply to the first digit appearing on each card. For the meaning of subsequent digits, please see the above described leaflet.

0 General and theoretical	3 Preserved fish	7 Analytical Methods
1 Fish by species	4 Oils	8 Composition
2 Fresh fish	5 Vitamins	9 Miscellaneous
	6 Fishery byproducts	

Use of funds for printing this publication has been approved by the Director of the Bureau of the Budget November 23, 1956.

0.113 RESISTANCE THERMOMETER SPEAR FOR FIELD MEASUREMENT

Jason, A. C. and Lees, A. (Torry Research Station, Aberdeen, Scotland)
Journal of Scientific Instruments 36, 272-274 (June 1959)
Torry Memoir No. 13

Introduction.--Thermocouple measurements are sufficiently accurate for field applications provided a fairly sensitive galvanometer is used. Portable thermocouple potentiometers that are equipped with taut suspension galvanometers cannot be used under conditions of vibration or aboard a moving vehicle.

Resistance thermometer.--Initially, the authors constructed a resistance thermometer to measure the temperature distribution in fish (1) held in bulk aboard fishing vessels, (2) transported on road and rail vehicles, and (3) at every stage along the distribution chain. A resistance thermometer offered the most promising method for making point measurements rapidly and reliably under the varied and frequently adverse conditions encountered. This thermometer consists of (1) a probe or spear made from a short length of hypodermic tubing with a copper resistance element at one end and (2) an associated measuring bridge that incorporates a heavily damped, null-indicating meter.

The spear consists of a length of 46 s.w.g. Bicelflux self-fluxing enamelled, copper wire (made by British Insulated Callender's Cables Ltd.) wound in two layers, each 32 millimeters long, around a hollow glass-former, to give a resistance at room temperature of about 11 microhms. The ends of the wire are taken through the inside of the former and soldered to 26 s.w.g. enamelled, copper leads. This element is cemented with Araldite into a stainless-steel hypodermic tube and inserted a short distance into the bore at one end of a stainless-steel tube that encloses the copper leads. The ends of the copper leads are soldered to terminals within a Tufnol handle on the opposite end of the larger tube. The glass-former is drawn from standard Pyrex tubing.

(over)

 ABSTRACTER: Martin Heerdt

0.4 A VITALLY IMPORTANT DISCOVERY

Anonymous
Fishing Gazette 76, 15, 68 (November 1959)

Relief for persons with high cholesterol levels in blood serum is indicated by research programs reported by the Department of the Interior.

The findings are the result of a series of research projects on fish body oil conducted by the Bureau of Commercial Fisheries, Fish and Wildlife Service and by the Hormel Institute of the University of Minnesota operating under a Bureau contract.

Bureau officials hope that their efforts will encourage clinical testing by responsible medical research staffs to evaluate the results obtained to date and to further explore the application of these results to conditions which may cause or aggravate atherosclerosis and kindred diseases. Bureau officials further state that the research has opened the way for the development of a food supplement composed of those fractions of fish oil which are the most effective in lowering the blood cholesterol level.

These discoveries were incidental to a Bureau basic research program to "take fish oil apart, molecule by molecule, and see just what it contains." Once the unique blood cholesterol depressant effects of fish oil were noted, research programs were inaugurated to explore them. Technicians state that there is still considerable basic research needed to fully explore the properties of fish oils.

The key findings of the research are (1) the abundance of what is known as "unsaturated" fatty acids in the body oils of many species of fish, and (2) proof that the feeding of these "unsaturated"

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0.33 BROWNING REACTIONS AND THE LOSS OF FREE AMINO ACID AND SUGAR FROM LYOPHILIZED MUSCLE EXTRACTIVES OF FRESH AND CHILL-STORED CODLING (GADUS CALLARIAS)

Jones, N. R. (Torry Research Station, Aberdeen, Scotland)
Food Research 24, 704-710 (November-December 1959)

Introduction.--One of the most serious problems with white fish products is their susceptibility to brown discoloration during storage at tropical temperatures. Evidence from work on meat indicates that an off-flavor associated with browning develops in the extractive fraction rather than in the protein compounds of the meat. This paper describes a study made to evaluate the extent of change (1) in the total and individual amino acids and (2) in the sugar concentrations in lyophilized muscle extractives from fresh and spoiling fish during a period of storage under near-dry conditions and tropical temperatures.

Material.--Trawl-caught codling of 18 to 24 inches in length were landed and maintained alive in sea water for not more than 24 hours or until they were killed for immediate analysis. Other trawl-caught codling were eviscerated and packed in ice at 2.5° C. to simulate conditions aboard a commercial trawler. Codling in lots were removed periodically for analysis.

Preparation of extracts.--Twenty grams of fillet muscle dissected from the anterio-dorsal portion of the codling was extracted with 250 milliliters of 75 percent volume-for-volume ethanol. To a 25-milliliter aliquot of extract, the author added 75 milliliters of chloroform at 15° C. The upper, aqueous layer, which separated from the emulsion, contained nonprotein, water-soluble compounds from the muscle. Aliquots (2 milliliters) of the chloroform-separated, ethanolic extracts were lyophilized in shallow, wide-necked bottles and were equilibrated in air to 60 percent relative humidity

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 ABSTRACTER: Martin Heerdt

0.5 OBSERVATIONS ON THE FUNCTION OF SODIUM IN THE METABOLISM OF A MARINE BACTERIUM

MacLeod, Robert A.; Claridge, C. A.; Hori, Aiko; and Murray, J. F. (Fisheries Research Board of Canada, Technological Station, Vancouver, British Columbia, Canada)
Journal of Biological Chemistry 232, 829-834 (June 1958)
Studies 1958, from the Stations of the Fisheries Research Board of Canada, FRB 533 (1959) (Ottawa)

Introduction.--Marine bacteria differ from land and fresh-water bacteria by requiring sodium ion for growth. Like other bacteria they also require potassium ion. Furthermore, the quantitative requirements of marine bacteria for sodium and potassium ions have been found to be very similar to those of animal cells in tissue culture. This point may be of considerable significance from the standpoint of evolution. Both sodium ions and potassium ions have been found to be essential for the oxidation of exogenous substrates by cell suspensions of a marine bacterium. A detailed investigation has shown that the requirement for sodium ion, but not for potassium ion, varies according to the substrate being oxidized. Individual enzymes tested in cell-free extracts of the organisms did not require the addition of sodium ion for activity.

Experimental.--The organism used in this study was isolated from sea water and tentatively identified as a species either of a Pseudomonas or a Spirillum. The procedures for growing the organism and preparing cell suspensions have been described by Tomlinson and MacLeod (1957). To obtain cell suspensions capable of oxidizing malate, citrate, galactose, and glucose, the cells had to be suitably adapted by incorporating the substrate to be oxidized into the growth medium. For this purpose, the substrate was added at a 0.5-percent level. Cells adapted to the oxidation of galactose could also oxidize glucose, therefore, they were used in this study of glucose oxidation. Cells were washed and suspended in a 0.052 M $MgCl_2$ solution for use in this study. The oxidation of substrates

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 ABSTRACTER: Martin Heerdt

SPEAR TYPE THERMOMETER

BROWNING OF MUSCLE EXTRACTIVES

FISH OILS AND BLOOD CHOLESTEROL

SODIUM IN BACTERIAL METABOLISM

0.33

and 40° C. over a sulphuric acid-water mixture. The bottles were maintained under these conditions for 3 days; the volume was then adjusted to 2 milliliters for the measurement of brown coloration at an arbitrary 430 mμ in a Hilger Spekker photoelectric absorptiometer microcell attachment.

Estimation of free amino acids and free sugars.--Aliquots (2 milliliters) of unbrowned, original, chloroform-separated, ethanolic extract were lyophilized and stored at -2° C. for analysis. The browned preparations were (1) relyophilized after the measurement of color and (2) stored at -2° C. for estimation of free amino acids by two-dimensional chromatography on Whatman No. 1 paper in phenol-ammonia and collidine-lutidine. Aliquots of redissolved extractives, as prepared for amino acid estimation, were chromatographed on Whatman No. 1 paper in butanol-acetic acid for estimation of free glucose and ribose.

Results.--Taurine, the principal constituent of the fraction in fresh muscle, exceeded the total of the other amino acids. During storage of codling in ice, the levels of taurine tended to fall, whereas β-alanine tended to rise. The levels of glutamic acid, leucine, and α-alanine remained roughly constant. During storage of fresh codling muscle in ice, glucose tended to disappear; whereas ribose increased initially from zero levels and then decreased after 10 to 12 days of storage.

After 3 days at 40° C. and 60 percent relative humidity, the extractives from the flesh of both freshly killed and chill-stored codling all had developed brown coloration to varying degrees. Browning values increased slightly in extractives from fish stored in ice from 5 to 12 days and tended to be less scattered. Storage at 40° C. and 60 percent relative humidity in air led to losses of 40 to 60 percent in all of the amino acids obtained from extractives of codling at all stages of chill storage. In no case was it possible to attribute a high level of browning to the initial concentration or to the loss of any particular amino acid. In extractives from codling stored for 0 to 3 days in ice, the amount of browning was only roughly related to the glucose content of the muscle; whereas in extractives from codling stored for 12 or more days in ice, browning was related to the ribose content since glucose values were very low. The storage of extractives at 60 percent relative humidity and 40° C. for 3 days caused ribose to disappear entirely, and only occasional traces of glucose to remain.

0.5

by whole-cell suspensions was followed manometrically with the aid of a Warburg respirometer. Cell-free extracts of the organisms were prepared by sonic disruption of the cells in a Raytheon 10-kilocycle sonic oscillator.

Succinic dehydrogenase was assayed manometrically in the extract by measuring the rate of oxygen uptake in the presence of methylene blue. Potassium cyanide was omitted when the effect of sodium ion and potassium ion on the enzyme system was being determined. Fumarase was measured spectrophotometrically by observing the increase in optical density at 240 mμ with malate as substrate. Malic dehydrogenase activity was determined by following the rate of reduction of triphospyridine nucleotide spectrophotometrically at 340 mμ. For the cell-free extract studies tris (hydroxymethyl) aminomethane buffers were used throughout. Protein was estimated by the biuret method with crystalline pepsin as a standard. Sodium ion and potassium ion were assayed with the aid of a flame photometer attachment for a Beckmann DU spectrophotometer equipped with a photomultiplier.

Results.--With either acetate, butyrate, propionate, glucose, or galactose as substrate, cell suspensions of a marine bacterium required an approximately 50 mM concentration of sodium ion for maximal rate of oxidation. Three times this level of sodium ion was required for the oxidation of malate, and four times this level was required for the oxidation of citrate, fumarate, and succinate. No variation could be detected in the potassium ion requirement with different substrates.

In cell-free extracts of the organism, succinic dehydrogenase and fumarase were more active in the absence of added sodium ion and potassium ion than in the presence of these ions. Malic dehydrogenase required the addition of potassium ion for maximal activity. In all cases, levels of sodium ion and potassium ion required for maximal rate of oxidation by cell suspensions inhibited the activity of the enzymes in the cell-free extracts. With the substrate observed, differences in the sodium requirement of cell suspensions could best be accounted for by assuming that the di- and tribasic acids, but not the monobasic acids and hexose sugars, form complexes with sodium ion before crossing the cell membranes.

0.113

A flexible coaxial cable that connects the thermometer element to the bridge consists of an inner conductor of seven strands of 36 s.w.g. copper wire and an outer conductor of forty-eight strands of braided 38 s.w.g. copper wire. The cable introduces a total series resistance of 0.11 microhm per meter at room temperature.

The bridge was designed as a portable, self-contained instrument to measure temperature in the range from -30° to + 70° F. with an accuracy of about ± 0.2° F. By suitable calibration, other temperature ranges are readily available. The sensitivity of balance is limited by the choice of galvanometer and by the maximum current that may be permitted to flow through the element without producing a noticeable rise in temperature. The authors found that a normal wire-wound 100-microhm potentiometer (by Colvern Ltd.) was sufficiently linear to give direct temperature readings when used with an engraved scale on which the divisions were evenly spaced. The functions of the two preset potentiometers are to provide an adjustment so that each scale corresponds to 1° F. Initial settings are made by alternately immersing the spear to a depth of 12½ centimeters in two baths of known temperature and then successively adjusting both preset potentiometers to conform to the scale attached to the 100-microhm potentiometer set at the appropriate value for each temperature until no further adjustment is required. The galvanometer selected has a resistance of 75 microhms and a sensitivity at a reading of zero of 1.3 millimeters per μA. It is mounted on the top panel of the small box containing the rest of the components, including the 4.5-volt torch battery.

Errors resulting from resistance changes in the 26 s.w.g. lead wires in the spear at various depths of immersion were calculated to be within ± 0.1° F. in the range -30° to +70° F. Fluctuations in the resistance of a given length of flexible cable imposed a limit on the range of ambient temperature in which the instrument could be operated with the desired accuracy.

0.4

fatty acids to test animals reduced the cholesterol levels in direct proportion to the degree of unsaturation.

The term "unsaturated" in this instance applies to those fats in which there are carbon atoms which have not combined to the fullest possible extent and which are capable of uniting with certain elements or compounds to change the character of the fat.

A "saturated" fat, such as lard, congeals at low temperatures. An "unsaturated" fat does not congeal readily. This is the property which permits oil-laden fish to move freely in waters of low temperatures.

Bureau research has shown that about half of the body oil of most species of fish is unsaturated and about 10 percent of it is highly unsaturated. This latter portion of the fish oil contains five or six unsaturated carbon atoms per "chain," compared with only two such atoms in vegetable oil. In other words the potential of fish oil in reducing the cholesterol level is approximately three times that of vegetable oils.

Second only to the Bureau findings that unsaturated fish oils readily reduce the blood cholesterol levels is the development of a method to separate the highly unsaturated 10 percent from the rest of the oil. It is this method which makes it possible to utilize only the essential part of fish oil in reducing cholesterol levels. Thus the patient would take only one-tenth of the calories contained in the whole oil.

The process of separating the unsaturated fatty acids from the rest of the oil requires some very definite conditions to maintain the value of the product and avoid possible toxicity, Bureau officials state, adding that this is another reason why the findings should be clinically tested.

Among the fish which have liberal amounts of body oils are salmon, mackerel, and herring. Menhaden is not now used as food fish but it yields considerable amounts of highly unsaturated oils.

1.0153 INDONESIA

Koesoemowinoto, Soepanto (Chief, Technical General Division and Foreign Relations, Sea Fisheries Service, Republic of Indonesia)
Pacific Fisherman 58, 153-154 (January 25, 1960) (Annual Yearbook)

Introduction.--Production of the sea fisheries of the Republic of Indonesia can be increased. The purpose of this paper is to review Indonesia's accomplishments and current efforts toward greater productivity.

Building the industry, providing credit for fishermen, improving marketing, and carrying out research are the topics discussed.

Building the Industry

Industry is being built up by mechanization, extension of shipyards and workshops, and development of packing plants.

From 1955 through 1958, Rp. 94,169,600 was spent for mechanization of the fishing industry in Indonesia. (The Rupiah has a value of .0392 to the United States dollar.)

A fishery station is now under development; a fishing harbor was completed in 1958; and various shipyards and slipways are under development, approaching completion, and already completed.

Projects include an ice plant with a daily capacity of 20 tons; a pilot cannery that cans tuna; and a modern fishing community consisting of fish-flour plant, cannery, ice plant, workshop and slipway, net loft, fish-drying and fish-salting plants, and a training center.

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 ABSTRACTER: June H. Olden

1.8 A REPORT TO THE SHELLFISH INDUSTRY

Suomela, Arnie J. (Fish and Wildlife Service, Washington 25, D. C.)
Commercial Fisheries Review 21, 27-30 (December 1959)

A partnership program was set up by a memorandum of understanding between the Fish and Wildlife Service, the Food and Drug Administration, and the Oyster Institute on December 12, 1958. The objective of this agreement is to study the characteristics of oysters from various areas from the time of harvesting through to final destination. This is being done to accumulate data for use in evaluating and possibly amending the definitions and standards of identity for raw oysters in order to insure practical, enforceable standards that will protect the consumer.

Each of the participating groups has established a research team. These teams are under a Director who is empowered to organize and guide research under the new program.

Oyster and starfish research.--Two major problem areas continue to exist in the oyster industry on the East Coast of the United States. One problem center is Delaware Bay, where oyster mortality is high and oyster production has reached an extremely low level. The other problem area is in Long Island Sound where starfish are abundant and their predation has caused great loss.

The U. S. Fish and Wildlife Service has taken a number of steps to assist the oyster industry in Delaware Bay: (1) they have allocated funds to Rutgers University for expanded research into the cause of the oyster mortality; (2) they have brought specialists in oyster pathology to the area for consultations regarding the cause of oyster mortality and to suggest steps to alleviate the situation; (3) $47,000 from the 1960 fiscal year's budget was allocated for the beginning of a long-range investigation of this and other shellfish mortalities; and (4) the Fish and Wildlife Service will soon have improved laboratory facilities in the Chesapeake area that will permit expanded and more

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 ABSTRACTER: Kathryn L. Osterhaug

1.79 THE NURSE SHARK AND THE NURSE SHARK FISHERY

Carlson, Levy (Bergen, Norway)
Fiskeridirekt. Skrifter Ser. Fisk. 4, No. 1, 1-35 (1958)

The nurse shark (Greenland shark) is variously named Canis carcharias, Acanthorhinus carcharias, or Somniosus microcephelus. The largest examples are 6 to 8 meters long, but the usual length is 3 to 4 meters. This shark thrives at depths of 200 to 600 meters, where temperatures are near 0° C., but they visit the surface when hunting. Nurse shark also are called "mud shark" because they prefer muddy bottoms, and "sleeper shark" because of their indolence. The principal food of these fish is cod, halibut, coalfish, seal, and whale, but they will devour anything in their path, and they have been known to swallow a man, and even a reindeer. Nurse shark ovaries may contain up to 500 eggs the size of a hen's egg; their young are born alive.

The fishing areas are Denmark Strait, West Iceland, Bear Island, Svalbard, Barents Sea, the coasts of Norway off Troms, Møre, and Finnmark, the Shetland and Faeroe Islands, and West Greenland. The fish are also found as far south as Oslofjord in Norway and Halifax, Canada in North America. Sealing and nurse-shark fishing are often combined, and most nurse sharks are caught from Norwegian vessels. The fishermen use long lines with winch drive, and hoists with large iron hooks, and steel straps. The best bait is seal blubber or nurse-shark meat. Usually only the liver (about 12 percent of the total weight) is saved; the rest of the carcass is thrown overboard. Fishing was intensive during the prewar and postwar years, with a high of 1424 metric tons of oil and 694 metric tons of livers landed in 1948, but by 1955 landings had dropped to 133 and 116 metric tons, respectively.

Livers average 60 percent oil, which separates after application of steam. When this is done on shipboard the residue is discarded overboard; but most of the livers that are landed without

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 ABSTRACTER: R. Paul Elliott

2.116 HOW TRANSISTORS CAN HELP FISHERMEN

Woodgate, R. W.
World Fishing 9, 28-29 (January 1960)

The transistor has swept into modern electronics with amazing speed. In a few years it has changed from an expensive laboratory device to a mass produced article. We are offered transistor radio receivers, portable record players, tape recorders and a multitude of gadgets which are proudly claimed to be "fully transistorised." The transistor is now beginning to enter the marine field. Small portable echo-sounders, operating from self-contained dry batteries have been in use by yachtsmen and other small craft users for more than a year and one firm is putting on the market a full-sized paper recorder for seine-net fishermen, which uses transistors.

What is a transistor?--The transistor is an amazing device. Tiny sections of metals of extreme purify are carefully alloyed together, under conditions of cleanliness which exceed anything found in a hospital operating theatre, and then hermetically sealed in tiny containers. Because of their size, most of this work can only be done under a microscope or by the aid of automatic machines. As they are so small, light in weight, and have no fragile filaments, transistors will stand up to any amount of shock and vibration. Also, as a result of having no filament, they do not need time to "warm up." Just switch on and they work immediately.

The greatest advantages for marine use are that transistors operate at a very low voltage and are very efficient; this immediately gets rid of motor generators and vibrator power supplies. For example, completely transistorised equipment will run directly off a ship's low voltage supply and use very much less current than similar equipment using valves.

What it can't do.--There are disadvantages. Most of them are being overcome, but it will take some years yet before transistors replace valves completely. First of all, transistors will not operate at high power at the higher frequencies. For example: while it is quite possible to obtain 50

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INDONESIA

THE NURSE-SHARK FISHERY

RESEARCH ON SHELLFISH CULTURE

TRANSISTORS FOR ELECTRONIC INSTRUMENTS

1.79

treatment are processed at Sunnmøre where the residue can be further extracted, pressed, and dried as a meal rich in vitamins A, D, and the B group. The oil contains 13 to 20 percent unsaponifiable matter, whereas medicinal cod oil contains 1 percent. The oil is high in vitamin A but low in vitamin D. The vitamin A is used in enrichment of foods after concentration by molecular distillation or Solex extraction. The unaltered oil cannot be used as food because of its taste and odor. The vitamin A content of the oil parallels the vitamin content of the food of the shark. Highest levels were found in oils from the Shetland and Faeroe Islands (500 to 900 International Units per gram and lowest levels from north of Disko Island, the Finnmark coast, and the Barents Sea (1000 to 2500 I.U. per gram).

Eskimos use the skins of nurse shark for footwear because it is tough, without pores, and airtight. Before World War II, Germany bought many of the skins for tanning, but in recent years no one has done so.

Greenland Eskimos and Icelanders use small quantities of the meat as food, but otherwise such use has been limited to wartime emergencies because the ammoniacal odor that develops, unless the meat is used or preserved on the same day it is caught, makes it unpalatable. Dogs fed nurse-shark meat that was highly ammoniacal developed intoxication similar to human drunkenness. The meat composes 50 percent of the total weight of the fish and contains about 13.5 percent fat and about 12.5 percent fat-free dry material.

2.116

watts of power to drive a loud-speaker, as yet no transistor is commercially available which would give 50 watts of power in a radio transmitter working on the fishing bands. For this application we still have to use valves. Second, transistors are not so flexible in use as valves. This means that a small portable radio using four valves would need six to eight transistors to give the same performance; with a subsequent increase in cost. Against this increase in cost must, of course, be set the absence of any high voltage power supply. Even so, the transistor radio tends to be more expensive.

The main application.--It seems likely therefore that in the marine market, transistors will first be used in such things as echo-sounders, intercommunication units, and in the low frequency amplifier sections of receivers and transmitters where the high-frequency limitation on high power transistors do not effect their performance. There is one new and very important use for transistors. This is in the supply of high voltages for valve-operated equipment (for example in a radio transmitter). All fishermen know the motor generator and vibrator which supply power to the radio equipment. It is often difficult to find a suitable dry place to mount them and brush and contact wear make efficient maintenance absolutely necessary. By using transistors very efficient power supply packs are now being manufactured which can replace these older systems. The transistor converters have no moving parts and consequently require no maintenance. They can be hermetically sealed and, being small, are usually built into the equipment. This gives a neater, more compact unit without trailing cables from the set to the power unit and helps also to reduce the drain on the usually overloaded batteries.

As they will operate efficiently from small dry batteries, transistors are the ideal solution to most of the problems encountered in designing portable electronic equipment of all types. Small emergency transmitters for life-rafts are one example and will almost certainly be on the market in the near future. Trawl depth measurement is another problem which has been solved by using these devices, which have been built and used for experimental purposes without any trailing cables from the net. By using a small transistorized device sealed into a pressure container and fastened to the head-rope, almost any information can be transmitted up to the ship: depth, temperature, the pull on the warps, and so on.

1.0153

Providing Credit for Fishermen

Channels of credit have been extended to strengthen the financial position of small farmers and fishermen. Credit is currently supplied through a Farmers' and Fishermen's Bank and the Sea Fisheries Service.

Improving Marketing

Indonesian fishermen have not usually handled the marketing of their products but have passed this business to their customers without considering whether or not they received a reasonable price. The author points out that through the establishment of fishery cooperatives, it is hoped that the fishermen will gradually be able to decide what must be done with their own products. This can be achieved by (1) setting up fish auctions, (2) setting up central fish-salting concerns for joint sale of the product, and (3) marketing the fish directly to the consumer. Fish auctions have already been put into operation.

Carrying Out Research

Research projects include (1) Biology--research on species of fish, kinds of fisheries, and plankton; on exploratory fishing; and on pearl culture. (2) Fishing technique--research on long-line fishing, shrimp trawling, trolling, and other fishing methods. (3) Technology--experiments on canning and on artificial drying of fish. (4) Miscellaneous--research on efficiency of vessels and engines, on oceanography, and on socioeconomics.

1.8

effective shellfish research.

The starfish problem in Long Island Sound is extremely important. When the 1957 year-class of starfish was found to be unusually large, the Service called a meeting of government and industry people to explore the possibilities of assisting the oyster industry. As a result of these meetings, the Service made available an extra $64,000 to the Milford, Connecticut, laboratory to work on the starfish problem.

The Service is also cooperating with the states of New York and Connecticut to determine the effectiveness of present known methods of starfish control.

Other shellfish research.--Other shellfish culture studies at the Milford laboratory are aimed at improving hatchery practices and developing means of providing preserved larval foods for use in oyster and clam hatcheries.

At Boothbay Harbor, Maine, laboratory staff members are working on the problem of controlling the green crab, which is a clam predator. At Gulf Breeze, Florida, scientists are investigating the possibility of biological control of oyster enemies. Research, at Beaufort, North Carolina, has been carried on for a number of years with the cooperation of the Atomic Energy Commission to determine the accumulation of radioactivity by fish and shellfish at various levels of pollution.

2.01 THE EFFECT OF SODIUM CHLORIDE ON PROTEOLYSIS AND ON THE FATE OF AMINO ACIDS PRESENT IN THE MUSCLE OF CODFISH (GADUS CALLARIAS)

Bilinski, E. and Fougere, H. (Fisheries Research Board of Canada, Technological Station, Grande-Riviere, Quebec)
Journal of the Fisheries Research Board of Canada 16, 747-753 (October 1959)

Introduction.--Labrie and Gibbons (1937) investigated the spoilage of cod muscle press juice and noted (1) that sodium chloride retards the formation of trimethylamine and (2) that the rise in volatile bases is related to the production of ammonia. Winter (1950) has shown that ammonia, trimethylamine, and amino acids are produced appreciably faster in unsalted than in salted fish muscle. The present investigation was made to study the kinetics of protein degradation, the fate of the amino acids involved, and the formation of trimethylamine and of indole in codfish muscle that contained sodium chloride.

Experimental.--Cod were caught in July, delivered to the laboratory in less than 1 day, and filleted immediately. Fourteen fillets, each weighing about 500 g. were taken from seven fish and ground in a meat chopper. NaCl was added to four portions of the chopped fish muscle to obtain final concentrations of 4, 8, 12, and 16 percent, respectively, on a wet basis. A homogeneous distribution of the initial bacterial flora and NaCl in the minced muscle was obtained by means of a Hobart mixer. Each portion was divided into two series of samples. One series was stored at 15° C. and the other at 25° C.

Methods of analysis.--Total nitrogen was determined by the Kjeldahl method as described by Hawk et al. (1947). Free amino acids were determined at pH 2.5 by the ninhydrin titrimetric method of Van Slyke et al. (1941). Total volatile bases and trimethylamine were estimated by Beatty and Gibbons' (1937) modification of the microdiffusion technique of Conway and Byrne (1933). Ammonia was calculated. Indole was determined by the p-dimethylamino-benzaldehyde method of Duncan et al. (1957). Deamination of the α-amino acids was indicated by the disappearance of free amino acids and the

 ABSTRACTER: Martin Heerdt

2.116 ELECTRONIC SECTOR-SCANNING ASDIC: AN IMPROVED FISH-LOCATOR AND NAVIGATIONAL INSTRUMENT

Tucker, D. G. and Welsby, V. G. (Electrical Engineering Department, University of Birmingham, England)
Nature 185, 277-279 (January 30, 1960)

Underwater acoustic echo-ranging systems are used extensively in the form of vertical-beam echo sounders and of horizontal-beam asdic, but the performance of these systems is severely restricted by their single-beam characteristics. In these systems, the pulse is transmitted by a transducer and a receiver after it has been reflected from the bottom or from some other object by a transducer. The time difference between the transmission and the receipt of the pulse, which measures the range of the bottom or other objects, is recorded on a chart by a stylus moving at a speed equal to the velocity of sound in water multiplied by the ratio of the width of the chart to twice the maximum range of detection. The transmission of the pulse marks the left-hand edge of the paper, which is moving at right angles to the stylus sweep, and any echo received causes a mark at a point in the stylus sweep corresponding to the range of the object causing the echo.

A new system has been developed that retains most of the characteristics of the existing devices, but also gives simultaneous information over a wider sector of search with good angular and range resolution. The new system can also eliminate the need for mechanical movement of the heavy electro-acoustic transducer, and thus greatly reduce the cost of ship-fitting operations. Other distinctive features of the new system include the fact that the receiving acoustic beam is relatively narrow and is swung continuously over a large sector by electronic means with the rate of sweep so high that the sector is covered within a time less than the duration of the transmitted pulse. Thus, because the transmitted beam covers the whole sector, the echoes arising anywhere in the sector are

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 ABSTRACTER: Harold C. Johnson

2.116 CENTRALIZED FISHING BOAT CONTROL

Anonymous
National Fisherman 40, 9, 24 (January 1960)

The first central control system to be installed on any fishing vessel built in the United Kingdom is on the British trawler, Hazlehead. The equipment on this vessel enables one man to control complete operations from the wheelhouse. Centralized control also has provided an opportunity for streamlining and modernizing the shape of the wheelhouse.

The control unit is designed for vessels whose service does not warrant the inclusion of a gyro compass and automatic steering. It incorporates the hand-operated electric steering control of an electro-hydraulic steering engine built into a console, and engine-room telegraph with repeaters, rudder angle indicator, main engine, controls, variable pitch propeller control, and also has provision for engaging and disengaging the clutch so that the main engine can be used for winching purposes when required.

The entire system is safeguarded by the inclusion of aural and visual alarms and provision is made for easy changeover from the console to local control in the engine room, should it be required. Once such a changeover is effected, the combined engine controller and telegraph then operates as a standard maneuvers telegraph. The electric steering control system is duplicated and controls the steering engine by means of two afterpower units. The complete system is cross connected so that either method of steering control can operate from each of the two afterpower units. In addition, the power supply to the steering control unit is duplicated and interchangeable.

If it is required, the electric steering control unit can include automatic steering using a gyro datum, as well as a gyro compass steering repeater. In this concept, course trimming, yaw, and weather controls are also provided. The electric steering control, with or without automatic

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 ABSTRACTER: Kathryn L. Osterhaug

2.12 SHRIMP EXPLORATION BY THE M/V OREGON ALONG THE NORTHEAST COAST OF SOUTH AMERICA

Bullis, H. R., Jr. and Thompson, J. R. (U. S. Bureau of Commercial Fisheries, Pasacagoula, Mississippi)
Commercial Fisheries Review 21, 1-9 (November 1959)

Two cruises of the U. S. Bureau of Commercial Fisheries exploratory fishing vessel Oregon were made, during the fall of 1957 and the late summer of 1958, off the Northeast Coast of South America. The primary objective was to obtain preliminary data on the shrimp resources of that region. The first cruise covered the general region extending from Trinidad to the mouth of the Amazon River, and the second cruise was largely devoted to a more detailed investigation of a smaller area off the coasts of British Guiana, Surinam, and French Guiana.

Commercial quantities of pink shrimp were found off the Guianas with optimum catches near the 30-fathom curve. The best night's fishing resulted in 576 pounds (heads-on) 6 to 10 count pink shrimp, off the Surinam River, obtained by dragging two 40-foot flat trawls simultaneously.

Brown shrimp were less common and scattered. Best catches amounted to 30 to 40 pounds (heads-on) per 1-hour drag. Sea bobs were prevalent in waters shallower than 16 fathoms.

Only small amounts of deep-water shrimp species were taken, although three species, royal-red shrimp, "scarlet" shrimp, and Solenocera vioscai, were found to inhabit the entire deep-water region.

Limited quantities of small red snapper were found in 31 percent of the drags made inside 50

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 Authors' summary

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received during each pulse repetition interval. The received information is displayed on a cathode-ray tube in which one axis of deflection corresponds to bearing (by being synchronized to beam swing) and the other to range. The intensity of the spot indicates the strength of the echo.

When the transducer beam is tilted vertically with the beam set wide from fore to aft, but narrow from side to side, and scans from side to side, the display will show, for each pulse transmission, the bottom profile in some detail across the track of the ship. The ship's own motion forward enables the profile along the track to be recorded, thus one traverse of an area enables a three-dimensional picture of the bottom to be obtained. This is on a slant range but corrections can be made for true depth. The system already has been proved able to give information on the horizontal and vertical distribution of fish, particularly on their movement.

A schematic diagram and outline of the system is given in the article; however, technical description and design considerations have been published in previous papers.

To summarize, it is thought that the new electronic sector-scanning asdic has considerable possibilities in: (a) detection and location of fish; (b) identification of fish by their shoaling habits, echo-strength, and shape; (c) research in fisheries work, for example, in studying the structure and internal and overall movements of fish shoals, and even of individual fish; (d) navigation; and (e) hydrographic surveying.

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fathoms. Lane snapper and a variety of other fishes, including sea catfish, sea trout, and croaker-like species, were also found in abundance in shallow waters.

Good trawling bottom is present in most areas of the coast out to the 50-fathom curve. The bottom generally consists of soft mud out to 20 to 25 fathoms and a mixture of mud and sand from 25 to 50 fathoms. Beyond 50 fathoms an extensive zone of rough coral and rock bottom extends, in many localities, to the edge of the continental shelf.

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formation of ammonia, according to the method of Beatty and Collins (1939). Hydrolysis of muscle protein into fragments of lower molecular weight soluble in 80 percent ethanol was measured by the decrease in nitrogen in the residue after alcoholic extraction.

Results and discussion.--The hydrolysis of muscle proteins was completely inhibited at salt concentrations of 16 and 12 percent at both temperatures and with 8 percent NaCl at 15° C. However, with 8 percent NaCl at 25° C., the proteolytic effect started after 1 week. With 4 percent NaCl, pronounced hydrolysis of muscle proteins took place at 25°, as well as at 15° C. The inhibitory effect of 4 percent NaCl on the hydrolytic breakdown of muscle proteins was very limited. In the absence of hydrolysis of proteins, an initial limited increase in free amino acids was noted over a wide range of salt concentrations as the result of hydrolysis of peptides originally present in the muscle.

Salt appeared to have only a slight retarding effect on the deamination of α-amino acids although the retardation was more pronounced at higher concentrations. With 16 percent NaCl at 25° C., deamination is indicated by a simultaneous increase in ammonia and disappearance of free amino acids. Similar changes occurred with 12 percent NaCl, and the process was more rapid at 25° than at 15° C. With 8 percent NaCl at 15° C., the breakdown of amino acids is still faster. Breakdown was inhibited only at 16 percent NaCl and 15° C.

During the hydrolysis of muscle proteins, the effect of the deaminase tends to be exceeded by the liberation of free amino acids. At 25° C. with 8 percent NaCl, the free amino acids show a decrease during the first 6 days. Thereafter, the tendency is reversed. With 4 percent NaCl, proteolysis is so pronounced that the amino acids show a sharp increase and ammonia is formed in large amounts. About 0.40 mg. of indole per 100 g. of muscle was found after 7 days in the sample treated with 4 percent salt and incubated at 15° C.; whereas in a similar sample incubated at 25° C., 0.25 mg. of indole per 100 g. of muscle was found after 2 days.

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steering from a gyro compass datum, can operate with any form of electro-hydraulic steering engine and is entirely suitable for all types of vessels.

The rudder angle indicator is operated by a rudder angle transmitter directly connected to the rudder stock and therefore indicates exact rudder movement. This system is suitable for any type of vessel, including those where one man has to control operations, such as trawlers where direct rod-gearing control of main machinery controls can be accepted.

Apart from the advantages of instantaneous steering control, which greatly reduces fatigue, the system lends itself to the incorporation of remote steering controls to be placed anywhere in the vessel. In trawlers, for instance, a small auxiliary unit is placed in the starboard trawl-control position, whereas in other boats remote steering controls would be placed in the bowbaulks or in the bridge wings. The electric steering control also lends itself to incorporation in any form of centralized control for convenient grouping of wheelhouse instruments.

In the early days, the bridge was merely an open space above the engine room. Today, from the bridge, the speed and direction of the ship are controlled; the fish are detected; the trawl winch is operated; and ship-to-shore communication is maintained. Instruments give the skipper exact information about his vessel's trim and stability and the speed of the various machines. The skipper also has a "broadcast" weather map showing the approach of bad weather, so that he can avoid it. Electronics play an important part in fishing and automation is increasingly being adopted.

2.12 RESULTS OF EXPLORATORY SHRIMP FISHING OFF WASHINGTON AND OREGON (1958)

Alverson, Dayton L.; McNeely, Richard L.; and Johnson, Harold C. (U. S. Bureau of Commercial Fisheries, Seattle, Washington)
Commercial Fisheries Review 22, 1-11 (January 1960)

This report combines the results of four shrimp cruises conducted by the U. S. Bureau of Commercial Fisheries exploratory fishing vessel John N. Cobb during 1958. The areas of exploration extended from Cape Beale, Vancouver Island, British Columbia, to Newport, Oregon. A total of 233 drags, each of approximately 30 minutes' duration, were made in depths ranging from 49 to 275 fathoms. The gear used was a 43-foot Gulf of Mexico-type flat shrimp trawl, except for 15 drags when a 72-foot Gulf of Mexico-type semiballoon trawl was fished. Green mud or a mixture of green mud and sand characterized areas in which good catches of shrimp were made. Bottom temperatures in the areas fished ranged between 42.1° and 46.7° F.

Good catches of ocean pink shrimp (Pandalus jordani) were made off the Washington coast between Destruction Island and La Push and moderate catches were made northwest of Cape Flattery. A number of drags made in the deep-water trough running southwest from Cape Flattery and on the offshore continental shelf failed to yield commercial quantities of shrimp. Areas of known commercial shrimp grounds were avoided.

Commercial quantities of pink shrimp were located along the Oregon coast west of Tillamook Head, Manhattan Beach, and Cape Lookout. Trawling off Tillamook Head yielded catches at rates up to 2,800 pounds heads-on shrimp per hour. Drags between 61 and 90 fathoms resulted in the highest catch rates, although fishing was also productive between 91 and 120 fathoms.

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 ABSTRACTER: Harold C. Johnson

2.1471 PACIFIC COAST DRUM TRAWLING EQUIPMENT NOTE NO. 2

Wathne, Fred (Bureau of Commercial Fisheries, Seattle, Washington)
Commercial Fisheries Review 21, 34-36 (December 1959)

Drum trawling was introduced into the Pacific Northwest otter-trawl fishery in 1954 following the development of drum purse-seining. There are several advantages to drum trawling over conventional trawling: (1) the net can be handled more rapidly and with less labor; (2) the trawling operation is safer because the overhead handling of gear is eliminated and the amount of total handling required is reduced; and (3) the operation can be carried out more easily in rough seas; and (4) it is more difficult for the fish to escape from the mouth of the trawl when it is being picked up.

The drum-trawling method is adaptable to the trawling system that is used on the Pacific Coast, in which the net is towed from davits located on each quarter of the stern. No major modifications in net rigging are necessary to convert the trawl to the drum method.

The principal unit of the drum-trawling system is the drum upon which the trawl is wound. The drum is constructed of sheet steel and is designed to accommodate a conventional otter trawl. The flanges of the drum are 4 to 5 feet in diameter and 5 to 8 feet in length. The trawl is secured to the drum by stopper chains that are fastened near each end of the core. Power is supplied either directly by an independent hydraulic or mechanical drive system similar to that used for drum seines (Smith 1954), or indirectly by means of a wire rope running from the main winch drum to a drive reel on the side of the trawl drum.

The following is a description of a trawl equipped with a single dandyline: (1) The bag of the trawl is thrown overboard and the net unwinds from the trawl drum as the vessel moves ahead. (2)

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 ABSTRACTER: Kathryn L. Osterhaug

2.1471 WHY NOT A FOUR-MAN FISH TUG

Anonymous
World Fishing 9, 24-26 (January 1960)

Trawling vessels for use in distant water fisheries continually have been growing larger. The size of these vessels is dictated more by where the vessels go to fish than by their actual trawling needs. For vessels that fish nearer home it might be wise to return to a smaller, more specialized trawler.

The development of the diesel engine has permitted the use of increased horsepower in a given vessel, which presents possibilities that have not as yet been fully realized. The trawler when fishing is simply a tug. The logical approach to the design of a local trawler would be to put the best possible power into the vessel and then arrange the gear so that it can be worked by as few men as possible.

The Fair Isle, a 73-foot trawler with a 240-horsepower diesel engine is an example of a small craft with good power. Such a boat built for stern trawling would make a four-man fish tug.

The tug could be of wood or steel, could vary somewhat in length and beam, and could use more power, such as three 6L3 engines ganged for diesel electric or diesel hydraulic propulsion. The revolutionary part of the vessel would be the layout and design for working on deck. The target is complete mechanical handling of the gear. This could be achieved by placing a suitable winch amidships facing aft over a clear middle deck. The winch would be used to heave everything except the doors around the drums until the footrope bosom is up to the taffrail roller. By the use of the "lazy decky," the cod end could then be brought around to either side and lifted in the present way. To

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 ABSTRACTER: Kathryn L. Osterhaug

3.24 EXPERIMENTAL STUDY ON FROZEN SARDINES

Boury, M.
Rev. Gen. Froid, Fr. 35, 845-849 (Sept. 1958)
Bulletin de L'Institut International du Froid 39, 1526 (1959) (Paris)

Four lots of sardines were frozen; some fish had previously been headed and dipped in brine. The sardines put in boxes were either quickly frozen (in tunnel at -30° C.; fish removed at -21° C., -25° C. after 12 hrs.), or slowly frozen (quiet air at -20° C., fish removed at -2°, -4° C. after 13 hrs.). The storage time was 1 to 7 months at -20° C., without glazing. Thawing was either rapid (in brine) or slow (in air). These sardines were finally canned.

The results were found to depend to a large extent on the original quality of the fish treated because the defects tend to increase during the storage (increase of tearing, occurrence of spots due to blood effusion, change in muscular texture in slow freezing; flushing of the flesh along the backbone, due to extravasation of blood on thawing).

Heading prior to freezing decreases the danger of tearing and flushing around the backbone, but favors oxidation. This process is not to be recommended.

Brining must be advised against, for it favors oxidation (after 4 months' storage).

Coating with algin seems slightly to decrease the defects after 5 months' storage.

The rate of freezing is of real importance, but differences vanish after canning because of the

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 Reprinted in whole

PACIFIC NORTHWEST SHRIMP EXPLORATION

TUG-TYPE TRAWLER

DRUM TRAWLING

FREEZING SARDINES

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allow this, each winch drum would have to be large enough to take one wing of the trawl or seine.

Four fishermen could work this boat, using a 56-foot trawl and 7-foot doors. The crew could consist of a skipper, a mate, an engineer who works on deck, and a cook who does the same. These men would be well paid if they bring in the fish. By dividing the present crew's share, the four would get the money that normally is divided among 7, 8, or 9 men.

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coagulation of proteins. It may be concluded that quick-freezing is a safer means to obtain satisfactory results.

Conditions of storage after freezing are important; a short period at 0° C. (1½ to 4 days) results in the development of marked defects. Even when maintaining sardines constantly at -20° C., it is not recommended to exceed 3 months' storage.

The thawing process is immaterial; however, thawing in brine makes tissues firmer and facilitates handling.

For canning, frying and steaming give satisfactory results if the fish is free of oxidation marks; however, frozen sardines tend to dehydrate more completely. Frying must be done at a temperature not exceeding 118° C. Canning must occur as quickly as possible after cooking. As a general rule, canned fish must not be marketed too soon; this is especially true for canned frozen fish. The minimum is from 3 to 6 months.

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Fish taken during shrimp trawling included smelt, small "soles," and eelpouts; however, on one occasion 4,000 pounds of dogfish were taken in a half-hour tow. A detailed fishing log showing geographic position, depth, date, catch, and relative data for each drag, is available as an appendix to the reprint of this article.

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When the trawl and trawl bridle have been set, the drum stopper chains support the strain of the gear. (3) At this time, the dandylines are reeved through the towing ends of the trawl bridles, the strain is taken off the stopper chains with the winch, and the chains are disconnected. (4) Setting is then continued until the end of the dandyline is reached, the doors are hooked on in the conventional manner, and the set is completed by slacking out the required amount of warp.

Picking up the gear. -- (1) The doors are hauled back to the davits and, in contrast with the doors used in conventional trawling methods, are completely disconnected from the dandylines--this is facilitated by replacing the conventional "Kelly-eye" with a "G-hook." (2) The gear is hauled in until the foreward end of the trawl bridles appears. (3) The stopper chains are then connected. (4) The gear is slacked off slightly until the stopper chains take the strain off the trawl, and then the dandylines are disconnected from the doors, removed from the trawling davits, and connected to the drum-drive wire. (5) The trawl is then started onto the drum. (6) When the trawl has been wound onto the drum as far as the intermediate trawl section, the portion of the trawl remaining in the water is lifted with a single-block lift; the fish bag is brought alongside by turning the vessel; and the splitting operation is carried out in the usual way.

2.1471 SPANISH PAIR-TRAWLER OPERATIONS

Martin, W. R. (Fishery Biological Station, St. Andrews, New Brunswick, Canada)
Trade News 12, 3-6 (December 1959)

Canadian fishermen are interested in the apparent efficiency of Spanish pair trawlers. While their cod traps and dory schooners are disappearing, bigger, and better-equipped Spanish pair trawlers are being built for codfishing in the Northwest Atlantic. In order to learn more about pair trawling, a team of Canadian observers boarded a Spanish trawler in September 1959 while it was fishing the Grand Bank. The Playa de la Concha, a trawler of 373 gross tons and 140 feet overall length, fishes with an identical twin, the Elizodo. In addition to the captain and the fishing skipper, there is a crew of 21 men on each trawler.

A striking feature of pair trawling is the huge size of the light-weight net that is used. The headline is 320 feet and the footrope 390 feet, which is more than three times as long as the corresponding lines of the largest Canadian otter trawls. Pieces of chain are used to hold down the groundline, and a continuous string of about 180 glass floats raises the headline to give the net a tremendous mouth.

Pair trawlers use a tremendous amount of towing cable. The trawler that was observed by the Canadians had 700 fathoms of cable in the water. Each towing cable consisted of 215 fathoms of 1-3/8-inch combination wire rope next to the net followed by 55 fathoms of 7/8-inch wire, and then 430 fathoms of 3/4-inch wire.

Each trawler fishes its net in turn. After the net is thrown over, one wing is taken by the twin trawler, and then one towing warp is paid out by each vessel. For dragging, the wire is hooked by a chain to a towing block on the stern. The trawlers drag the net at about 2 miles per hour for from 2 to 4 hours before hauling in the net. If they run into no difficulty, a pair of trawlers will make four or five hauls in a day.

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 ABSTRACTER: Kathryn L. Osterhaug

2.15 SANITATION ABOARD FISHING TRAWLERS IMPROVED BY USING CHLORINATED SEA WATER

Linda, Arvey H. and Slavin, Joseph W. (Fishery Technological Laboratory, East Boston, Massachusetts)
Commercial Fisheries Review 22, 19-23 (January 1960)

In 1958, a project was started at the East Boston technological laboratory of the Bureau of Commercial Fisheries to develop a simple, inexpensive, and effective means of improving sanitation aboard fishing trawlers. Based on the success that has been achieved in improving sanitation in processing plants by chlorinating the water supply, the investigators decided to use chlorinated sea water.

Chlorinating equipment.--The equipment used for chlorinating the sea water aboard the vessel consisted of a motor-driven, sodium hypochlorite metering pump, a storage drum, and chlorine test equipment. The metering pump and motor were mounted on a common base. The pump was of the diaphragm type and was driven by a belt using a 1/8-horsepower, direct-current, electric motor. The length of the pump stroke could be adjusted to meter the desired amount of sodium hypochlorite into the line that carried the sea water used for washing. The flow of sea water through the lines varied from 20 to 60 gallons per minute. A rugged, 55-gallon drum was used for storing the sodium hypochlorite solution. On most New England trawlers, the compartment located below the wheelhouse provides an ideal place for locating the chlorinating equipment.

A chlorine colorimeter was used to determine the concentration of free chlorine in the water as it was discharged from the line. The colorimeter consisted essentially of a set of calibrated color standards, each representing a different concentration of free chlorine in the water. In practice, an operator adds a prescribed amount of stabilizer and reagent to a sample of treated sea water. The resulting color is then matched with the color standards, which are calibrated in parts per million.

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 ABSTRACTER: Kathryn L. Osterhaug

2.15 PROPER STOWING IMPROVES FISH QUALITY

Reay, G. A. and Shewan, J. M. (Torry Research Station, Aberdeen, Scotland)
National Fisherman 40, 7, 26 (December 1959)

The function of a fishing vessel and its crew is to catch fish and to preserve and land the catch in as fresh a condition as possible. Fish are exceptionally perishable and the designers of fishing vessels are concerned with the link in the chain that joins fish catching to final consumption. As far as the quality of the fish is concerned, what is done on the fishing vessel cannot later be undone or offset.

The first task is to chill the fish as thoroughly as possible and to keep it chilled until it is landed. Experience has demonstrated that fish such as cod and haddock spoil about two and one-half times as fast at 40° F. and about five and one-half times as fast at 50° F. as they do at 32° F.

Gutted fish usually are stowed in the hold with ice, either on shelves or in boxes. The amount of ice must be sufficient to cool the fish quickly to just above freezing. The ice must be mixed intimately with the fish to insure rapid cooling. Fish that are more than 2 to 3 inches thick should be stored in layers that are not more than one-fish deep.

In theory, one part of ice is required to cool seven parts of fish from 55° to 32° F. This is not possible in actual practice, however, because the distribution of ice and fish can never be ideal and some of the ice is consumed in cooling such things as shelves and fittings.

Provision must made to prevent or compensate for the absorption of heat entering the fishroom from the outside so that no part of the catch is denuded of ice and allowed to warm up. The correct

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 ABSTRACTER: Kathryn L. Osterhaug

3.5 CHARACTERISTICS OF COD LOW IN SALT

Freixo, J.
Conservas de Peixe 13, No. 152, p. 18 (Nov. 1958) (In Portuguese)
World Fisheries Abstracts 10, 31-32 (September-October 1959)

In Portugal, salted cod low in salt content develop disagreeable tastes and odors. These result from decomposition products, such as ammonia, amino acids, butyric and propionic acids.

In studies carried out by the Comissao Reguladora de Comercio de Bacalhau (CRCB) the causative organisms were found to be Staphylococci, particularly Staphylococcus pyogens aureus. This organism, which is Gram-positive, has optimum growth in 10 to 15 percent brine at 37° C. (98.6° F.) and coagulates milk with the production of acids. It grows well in salted fish stacked wet and held without refrigeration. Diffusing tissue juices rich in proteinaceous substances and high in salt content constitute a good medium for the growth of the organism. As a result of the activity of this organism, fish develop a rubbery texture, a yellow color, and ultimately a disagreeable taste and odor.

The sources of contamination are fish holds, storage and various handling equipment.

In Portugal, 5,250 kg. (11,570 lb.) of salt to 6,000 kg. (13,230 lb.) of cod (fresh dressed weight), is considered most suitable. However, this proportion may vary with the quality of salt and the size of the fish. Wet cod with less than 16 percent salt is considered as low in salt, whereas well-salted wet cod contains not lower than 17 percent salt. The composition of 2 varieties of Portuguese wet cod, the 'Nacional' (National) and 'Terra Nova' (Newfoundland), as worked out at the laboratories of the CRCB are given in a table (see over).

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 ABSTRACTER: F. Lopez-Capont

SPANISH PAIR TRAWLING

STOWING FRESH FISH

FISH-BOAT SANITATION

SALT COD

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deployment and requirement of ice can be determined only from experience with the individual vessel. The most serious problems are encountered in uninsulated vessels, and the fewest problems are encountered in vessels in which the fishroom is insulated and the use of insulation is combined with jacket cooling.

The use of deckhead refrigerating grids, which have been installed in insulated holds in some instances, has been found in practice to have less advantage than expected. Deckhead grids, in which the refrigerant is usually well below the temperature of melting ice, cool the air immediately under the deckhead. As the cooled air falls, all the air in the fishroom gradually will be cooled and the air will cool any part of the room to which it can circulate. The chief uses of deckhead grids thus are apparently to cool the empty fishroom, to keep the ice in crisp, easily handled condition and to cool all shelves and fittings before the fish is stowed.

Grids can also keep the air cooled above "shelved" fish, with no more than a sprinkling of ice on top. At the top of the pens containing "bulked" fish, completely stowed in ice, the pipes can merely absorb heat coming from the deckhead and can have no effect on the temperature of any fish more than a few inches down in the stowage.

There is some danger of superficial drying of the "shelved" fish and also of freezing some of the fish, whether "shelved" or "bulked." This latter can readily happen since unavoidable local variations in air temperature during stowing are bound to occur in the air above the pens, and accurate thermostatic control from one single point is not really possible. Frosting and defrosting of the coils also contribute practical problems. On balance, it seems clear that deckhead grids offer no proved advantage in preserving the cargo as compared with the use of plenty of ice. The jacketed hold represents a much more sensible approach to this whole problem than do even extended grids over the sides and bulkheads. Unless the jacket is hermetically sealed off from the fishroom, however, desiccation of "shelved" fish may still occur.

Some thought is being given to new methods of storing fish on the vessel such as the use of large containers that would be filled at sea with fish and ice and lifted from the hold at the port.

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Composition of Portuguese salted wet cod

Content/100 g. cod	Nacional	Terra Nova
Moisture	42.6 g.	40.0 g.
NaCl	17.4 g.	14.4 g.
Total nitrogen	5.6 g.	7.0 g.
Nonprotein nitrogen	506.3 mg.	1,029.2 mg.
Free amino acids	124.3 mg.	286.5 mg.
Total volatile nitrogen	45.7 mg.	78.1 mg.
Ammonia	24.3 mg.	45.5 mg.
Trimethylamine	20.4 mg.	30.7 mg.
Other amines	1.4 mg.	1.6 mg.

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In some ways, pair trawling is similar to Danish seining. The shine on the warps indicates that about half of the towing wire scrapes along the bottom, driving fish into the path of the net. As with Danish seining, there is so much gear on the bottom that there is danger of fouling. Smooth bottom is essential to successful operations.

One haul taken during the observation period brought in approximately 6,000 pounds of fresh fish, about two-thirds of which were large, market cod and small, steak cod. By watching the fishcope, one of the observers estimated that an otter trawl on the same ground would take a much smaller catch, only a few hundred pounds. Pair trawlers are reported to take more fish per day on smooth-bottom grounds than do otter trawlers. In contrast, however, otter trawlers make good catches along the edges of the banks where pair trawlers cannot fish.

On the basis of limited observations, it is difficult to see how pair trawlers could pay in the Canadian offshore fishery. The increased risk in working as a pair, the harder work of handling the gear, the loss of independence through teamwork, the scarcity of smooth-bottom grounds, and the restricted operations after dark, would combine to prevent a pair of trawlers from catching as much fish as two trawlers dragging independently. With more fishing days and utilization of much of the fish discarded by Spanish pairs, the annual catch per pair might be increased by Canadians; but it could scarcely be doubled. Conditions might even favor part-time pair-trawling operations at some seasons on a few grounds. However, further observations are needed, particularly in late winter, before the feasibility of Canadian offshore pair-trawler trials can be seriously considered.

2.15 (Cross Reference: 3.18)

Experimental tests.--The chlorinating equipment was assembled at the East Boston laboratory and then installed on a commercial fishing trawler. The hypochlorite metering pump was adjusted to inject a 14-percent sodium hypochlorite solution into the wash-water line at a rate that resulted in a concentration of 50 to 60 p.p.m. of free chlorine in the sea water. The chlorinated water was used both to wash the eviscerated fish at sea and to cleanse the hold of the vessel at the end of each trip.

This equipment was used on board the trawler for a total of six regularly scheduled fishing trips. During the trial period, information was collected on the operation of the chlorinating equipment and observations were made of the sanitary condition of the fish hold and of the quality of the fish as it was landed.

Results.--During the entire period of the test, the chlorinating equipment operated in a satisfactory manner and required little attention. The chlorinated sea water was found to be effective for washing the fish and for cleaning the hold of the vessel. The treated water was judged to be more effective in removing the slime and blood from eviscerated fish than was plain sea water. The chlorine also seemed to minimize the staining of the fillets that ordinarily results from bleeding caused by forking the fish. The natural color and odor of the fish were not affected by the 50 to 60 p.p.m. of free chlorine in the water.

Examination of the fish landed by the test vessel indicated that, during the period that chlorinated sea water was used, the instances of bilgy fish were reduced in comparison with previous trips when only plain sea water was used. The crew of the test vessel observed that the chlorinated sea water removed the slime from the deck of the vessel more effectively than did plain untreated water. The resultant decrease in slipperiness is an important improvement in safety.

2.15 A REFRIGERATION SYSTEM FOR THE GULF 'TRASH FISH' VESSELS

Strauch, W. G.
Fish Boat 4, 37-38 (December 1959)

During the past few years, the so-called "croaker boats" have created a new and thriving industry along the Gulf coast. These boats--most of them converted from shrimping--have been trawling for croakers and other "trash" fish that are processed into canned food for cats and other pets.

Last year, a company in New Orleans was asked to design a refrigeration system for one of these croaker boats. The main requirement was for a system that would be easy to operate and rugged enough to provide years of trouble-free operation. It also was essential to keep costs as low as possible while maintaining top quality and efficiency of operation.

Refrigeration was to be used in two ways: first, to keep the trash fish in first-class shape so that it would command premium prices at the processing plant; and second, to preserve for human consumption the shrimp and other food fish that would be taken along with the croakers.

A system was designed and perfected that utilizes a heavy-duty ammonia compressor and a pipe-in-pipe condenser. Galvanized pipe coils are installed in the fish hold, and above the coils is a plastic pipe with needle holes from which water can be sprayed down onto the refrigerated coils. After the fish hold is flooded to a depth of about 18 inches, the water is drawn through a strainer, pumped into the plastic pipe, and sprayed over the refrigerated coils. With water temperature at 35°, several tons of ice can be built up on the coils and this, plus the water in the hold, will take care of a ton or more of fish per hour.

This system has already been installed on three vessels working in Gulf waters. The average boat to be refrigerated has been a typical trawler 55 to 65 feet in length. The hold must be

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 ABSTRACTER: Kathryn L. Osterhaug

3.3344 THE PACIFIC CRAB CANNING INDUSTRY OF BRITISH COLUMBIA PARTS I AND II.

Dewberry, Elliot B.
Food Manufacture 34, 425-429 (November 1959) Ibid. 34, 474-477 (December 1959)

In Part I are described the distribution, characteristics, life history, methods of fishing, and food value of the Pacific crab. Fishermen in British Columbia use a stainless-steel crab trap, 42 inches in diameter and 13 inches high, with two entrances and an escape hatch for crabs below the minimum legal size. Suspended inside is a glass jar with a perforated plastic lid containing the bait.

In Part II are described processing and canning operations and the preparation of frozen whole crabs.

Canning problems.--One problem that has been encountered in the canning of crab meat is the blue discoloration of the meat, together with staining of the cans. Recommended solutions to this problem have included (1) treating the meat with a dilute acid solution, (2) bleeding the crab by removing its appendages, and (3) bleeding the crab by puncturing the shell above the heart and placing the crab on its back for a few minutes. The present use of "C" enamel (seafood formula) for coating the interior of the cans minimizes discoloration of the tin plate and eliminates the need for parchment liners.

Successful crab-meat canning depends on the use of actively live, healthy, vigorous crabs; prompt butchering, cleaning, processing, and cooling; and prevention of contamination. All table surfaces, tanks, sinks, and strainers that come in contact with the meat should be made of stainless steel, aluminum, or monel metal to prevent contamination.

Preparation for canning.--The live crab is killed by removing the back shell, and the body is

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 ABSTRACTER: June H. Olden

3.239 POST-MORTEM CHANGES IN THE WATER-SOLUBLE PROTEINS OF BOVINE SKELETAL MUSCLE DURING AGING AND FREEZING

Kronman, M. J. and Winterbottom, R. J. (Eastern Regional Research Laboratory, U. S. Department of Agriculture, Philadelphia 18, Pennsylvania)
Journal of Agricultural and Food Chemistry 8, 67-72 (January-February 1960)

A number of biochemical changes identified with alterations in tissue properties are known to be associated with the salt-extractable, structural proteins of meat. These proteins include actin and myosin. Many processes, such as the production of lactic acid, are controlled by enzymes that are found in the water-soluble myogen fraction. Although these protein enzymes comprise only a small weight percentage of meat, the significance of the reactions they catalyze renders their alteration during aging and freezing of great importance.

The effect of aging and freezing on the extractability of the enzyme aldolase and on the other water-soluble proteins has been studied.

Experimental.--Details of the preparative and analytical methods were described by Kronman et al. (1960). The four bovine animals used included a 5-year-old cow and three 18-month-old steers. Muscle that had been dissected from the left side of the animal approximately 20 minutes post-mortem, or "fresh muscle," was compared with muscle taken from the same animal that had been held at 3° C. for 7 days, or "aged" muscle. Samples of the fresh muscle were frozen and stored at -20° C. for 5 weeks before they were thawed at 5° C. for 24 hours and extracted with water.

Both moving boundary electrophoresis and ultracentrifuge measurements were carried out on protein solutions in 0.05 ionic strength tris (N, N, N-hydroxymethyl) methylamine buffer at pH 8.17.

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 ABSTRACTER: Kathryn L. Osterhaug

3.61 ULTRASONICS SEEN AS VALUABLE AID IN DRYING HEAT-SENSITIVE FOODS

Anonymous
Chemical Engineering 66, 151-154 (September 21, 1959)
Food Engineering 31, 103 (December 1959)

Conventional heating to take out the easily removed moisture, followed by ultrasonics to remove the remainder is seen as an improved method of drying heat-sensitive foods or ones that have long drying cycles.

Best suited for these operations are static sirens (air-jet whistles). They are capable of producing intense, powerful acoustic emissions of over 1 kw., have no internal moving parts, are relatively inexpensive, and provide required flow turbulence. Efficiency is about 20 percent.

However, these waves do not provide sufficient turbulence to carry moisture away rapidly. For this reason, a partial vacuum or strong draft of air is necessary for satisfactory results. Extent of interface submitted to the waves is another factor governing rate of evaporation. Therefore, rotary or spray dryers give best results.

In the former, the slow turning motion provides a continuous renewal of product interface exposed to the sound. Spray dryers appear to be ideal for ultrasonic when emissions of 10 to 15 kc. per sec. are employed. The finely atomized wet globules can be held in suspension longer by an acoustic field. When the particles are vibrated by the sound waves their surfaces are exposed to more drying air.

Another factor in the use of ultrasonics is the effect of waves on agglomeration. With a large oscillation amplitude, the smaller globules agglomerate, and with a small amplitude the larger ones agglomerate. This leads to higher recovery rates and a change in size distribution of the products at the bottom of the dryer.

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 ABSTRACTER: Reprinted in whole

REFRIGERATED FISH HOLD

CHANGES IN WATER-SOLUBLE PROTEIN

CRAB CANNING IN BRITISH COLUMBIA

ULTRASONICS IN DRYING

3.239 (Cross Reference: 0.32)

Results.--Systematic differences in protein content and in the content of the enzyme aldolase were noted from muscle to muscle. Both the aging and freezing of meat were found to result in decreased extractability of the water-soluble proteins and in a loss of some specific electrophoretic and ultracentrifugal components.

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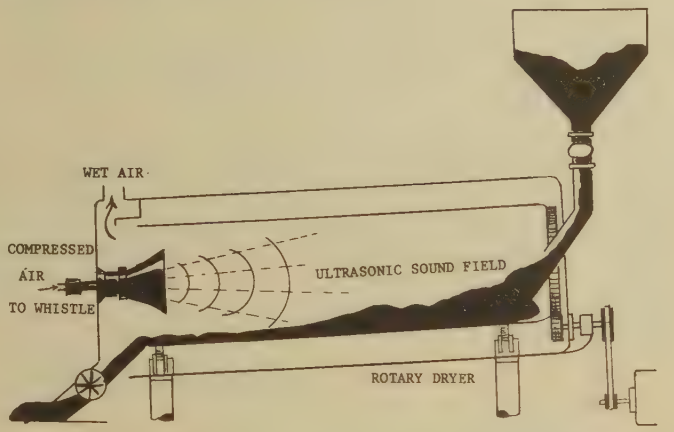
Rotary dryers with their slow turning motion that continuously exposes new surfaces to sound waves are ideal for application of ultrasonics.



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water-tight and properly insulated. Without any major changes, however, it is possible to locate in the engine room all necessary refrigeration machinery and to easily install the coils in the hold. It is recommended that an auxiliary engine be installed so that the compressor can be driven either by this auxiliary or by the main propulsion engine. Installing such an auxiliary is, in the long run, an economy since it will operate the system when the main engine is not turning. Ammonia was selected as the refrigerant because it will not burn and is nonpoisonous, and because the equipment that utilizes ammonia is heavy-duty, trouble-free in operation, and requires very little maintenance.

It was necessary to decide whether to use pipe coils in the fish hold or a shell-and-tube heat exchanger. Pipe coils were chosen because they have several advantages. Tons of ice can be accumulated on the coils before the fishing grounds are reached, so that the catch can be iced down as soon as it is brought aboard. The built-up ice also is available for quick cooling when especially large catches are made. And, finally, the ice on the coils will "hold" the catch in case of a machinery or power failure. The coils in the hold are of $1\frac{1}{4}$-inch hot-dip galvanized steel pipe custom-designed and bent at the factory to fit the individual boat. Special heavy-duty, hot-dip galvanized brackets are lag-bolted to the bins. The pipe coils are then bolted to the brackets with galvanized U-bolts and two connections for the coil are quickly made.

A 'jet' loader.--The circulating pump used to move the water in the hold doubles as a labor-saving device. This requires only the installation of a bypass valve in the line so that the water can be led to a deck hose. After dumping a net load of fish into the hold, the fisherman can disperse the catch evenly with the powerful jet of water being moved by the circulating pump.

The author reports that there are greater advantages than the labor-saving features to the refrigerated boat. First of all, the refrigeration will eliminate the ice bill; the food fish taken in the croaker trawl can be landed in top condition and without spoilage losses; and the boat can stay out as long as it takes to fill the hold.

3.3344

either broken or cut in half. After the gills, viscera, and intestines are removed, the halves are thoroughly washed under a jet of clean water. They are placed in stainless-steel wire baskets and lowered into brine tanks, which are kept at boiling point by live steam, and are cooked for 10 minutes. The cooked crabs are dipped in clean, fresh water, after which the pickers remove the meat from the body sections by shaking and rapping. They use a small wooden mallet to break the shells on the legs and claws so that the meat can be removed. The body and leg meats are kept separate. Next the meat is placed in a brine flotation tank containing a 100-percent solution of brine. Any fragments of shell present sink to the bottom. After further inspection, the meat is dipped in a solution of citric acid having a pH of 2.8, rinsed in clear, fresh water, and then dipped in an 80- to 100-percent brine solution. As a result of this treatment, the meat has a pH of 6.7, which prevents any oxidation of the meat when in the can. The meat is drained and pressed to remove excess moisture.

Packing in cans.--The crab meat is packed in $\frac{1}{4}$- and $\frac{1}{2}$-pound flat cans lined with "C" enamel. In the $\frac{1}{4}$-pound can, a layer of leg meat is placed on top of a layer of body meat. In the $\frac{1}{2}$-pound can, a layer of leg meat is packed at both bottom and top, with body meat in the center. The filled cans are inspected, check weighed, and conveyed to vacuum closing and sealing machines.

Processing sealed cans.--The sealed cans, packed in retort baskets, are processed at a temperature of 230° F. for 80 minutes in horizontal steam retorts. The cans are then immediately cooled, carefully examined, cleaned, labelled, packed in fiberboard cases, and transported for sale to Canadian markets.

Frozen whole crabs.--The crabs are boiled for 20 minutes, scrubbed, and immersed in a 100-percent brine solution at -6° F. for 20 minutes. The frozen crabs are glazed with water, wrapped in parchment paper or placed in polyethylene bags, and packed in fiber cartons for shipment under refrigeration to the West Coast of the United States and to Eastern Canada.

3.5 CHEMISTRY AND MEAT CURING

Hornsey, H. C.
Food Manufacture 34, 467-469, 473 (December 1, 1959)

Introduction.--Lean meat contains approximately 75 percent water. When meat is put into a strong salt solution, the brine becomes diluted with meat juices that diffuse outwards from the meat, and the juices within the meat become diluted with brine that diffuses into the meat. However, this two-way traffic is slow, even with multiple injections of brine directly into the interior of the meat, several days must elapse for the two-way diffusion to take place. When the surface of cured meat becomes dry the salt concentration in the outer layers--where bacterial contamination is most likely to occur--rises considerably and forms a protective layer.

Brines.--The meat juices in the brine support the growth of special types of halophilic organisms. Lactic acid that is present appears to be oxidized eventually to carbon dioxide and water; whereas nitrate is utilized as a source of oxygen and is reduced to nitrite, which is required for color development. After several lots of meat have been cured by the brine, this reaction, and the growth of the curing organisms, may reach such a level that nitrite itself, in addition to the nitrate, can be used as a source of oxygen to oxidize more lactic acid. If these reactions proceed unchecked, nitrite is formed, then decomposed, and gaseous nitrogen is liberated, which causes the brine to froth. Free potassium carbonate also is formed during the reaction and the pH of the brine increases, which accelerates bacterial growth. If no further lactic acid or other easily oxidizable substance remains, the amino acids present in the brine are utilized; and the resulting end products give rise to unpleasant odors.

Color.--The typical color of cured meat is caused by the formation of nitric oxide myoglobin (nitrosomyoglobin) from myoglobin, the normal pigment of fresh meat. The production of this

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 ABSTRACTER: Martin Heerdt

4.21 FATTY ACID OXIDATION BY CARP LIVER MITOCHONDRIA

Brown, W. Duane and Tappel, A. L. (University of California, Davis)
Archives of Biochemistry and Biophysics 85, 149-158 (November 1959)

Considerable information is available on lipide metabolism in animals and higher plants; however, there are essentially no reports on specific intermediary pathways of lipide synthesis and oxidation in fish. The few studies to date on aquatic animals have been primarily concerned with compositional analyses of body fat of marine and fresh-water fish that have been maintained on varying dietary regimes. Studies of lipide metabolism in fish are of interest for a variety of reasons, including the fact that these organisms are aquatic and poikilothermic. Furthermore they are unique among animals because they characteristically deposit large amounts of highly unsaturated fatty acids.

The results given in this paper are from studies aimed at describing some aspects of intermediary metabolism in fish. They indicate that the nature of the fatty acid-oxidizing system in fish is similar to that in mammals and demonstrate that fish liver mitochrondrial enzymes will readily oxidize a variety of fatty acids including highly unsaturated acids not previously used as substrates in similar enzymic systems.

Fish for use in enzyme studies must fulfill certain requirements, including continuous availability and ease of maintenance in small aquaria. Members of the minnow family (Cyprinidae), particularly the common carp, fulfill these requirements and have been used in these studies.

Results.--Carp liver mitochondria were shown to contain an enzyme system that will oxidize fatty acids in the presence of adenosine triphosphate, cytochrome c, and Mg^{++}. The addition of a sparking substance, that is, a small amount of a tricarboxylic acid cycle intermediate, considerably enhanced the rate of oxidation. Butyrate, octanoate, palmitate, oleate, linoleate, linolenate,

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4.91 DIET-TYPE (FATS CONSTANT) AND BLOOD LIPIDS IN MAN

Keys, Ancel; Anderson, Joseph T.; and Grande, Francisco (University of Minnesota, Minneapolis and the Hastings State Hospital, Hastings, Minnesota)
Journal of Nutrition 70, 257-266 (February 1960)

Introduction.--It is now well established that the concentration of lipids, especially cholesterol and beta lipoproteins, in the blood of man is markedly influenced by the fats in the diet. Other nutrients in the diet of some experimental animals also have been reported to affect the blood lipid concentration of young, growing animals maintained on an extreme deficiency or excess of a nutrient. In caloric equilibrium and with proper control of other factors, variations within the limits of natural diets in nutrients other than the fats are not influential in the diet of adult man.

Purpose.--The present paper reports the results of comparisons between two diets that differ in their type of carbohydrate. Diet A, an American-type diet, was relatively low in fruits and fresh vegetables and high in sucrose as compared with diet I, an Italian-type diet. Both low (L) and moderate (M) amounts of fat were incorporated into each of these two diets. Calorie balance was maintained in all diets, and an attempt was made to assure comparable protein, vitamins, and fat content of the diets.

Experimental.--Men were used as subjects in controlled experiments carried out with the above diets. Diets AL, American low fat, and IL, Italian low fat, provided 13 percent of calories from protein and 16 percent from fats. Diets AL and IL were identical, except (1) for providing 17 percent of total carbohydrate calories from sucrose and milk in diet AL in place of equal carbohydrate calories from fresh fruits, vegetables, and legumes in diet IL and (2) for a small accompanying exchange of proteins involving 4 percent of calories.

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 ABSTRACTER: Martin Heerdt

4.91 THE EFFECT OF DIETARY MARINE FISH OILS ON THE SERUM CHOLESTEROL LEVELS IN HYPERCHOLESTEROLEMIC CHICKENS

Wood, J. D. and Biely, Jacob (University of British Columbia, Vancouver, British Columbia, Canada)
Canadian Journal of Biochemistry and Physiology 38, 19-24 (January 1960)

Introduction.--Unsaturated vegetable oils in the diet lower the blood cholesterol levels in humans and in rats that have been made hypercholesterolemic by the addition of cholesterol and cholic acid to the diet. Unsaturated vegetable oils have the opposite effect when they are fed to chickens according to Stamler (1959). Anderson et al. (1957) found that sardine oil depressed the serum cholesterol level in man. De Groot and Reed (1959) found that cod-liver oil had a similar effect in rats and that the unsaponifiable portion of the cod-liver oil did not contain a cholesterol depressant factor. Marine oils contain moderately large amounts of highly unsaturated fatty acids and little or none of the essential fatty acids. Oils made from different species of cartilaginous fish contain varying amounts of highly unsaturated fatty acids. As the unsaponifiable content of this oil increases, the degree of unsaturation of the component fatty acids decreases.

To study the effects of various marine oils on blood serum cholesterol levels in chickens, oils were selected that varied considerably with respect to fatty acid composition, degree of unsaturation, and amount of unsaponifiable material.

Experimental.--The basal diet was composed of 54.9 percent wheat, 10 percent yellow corn, 5 percent oats, 5 percent wheat middlings, 5 percent wheat bran, 7.5 percent soybean oil (44 percent protein), 5 percent meat meal (50 percent protein), 2 percent herring meal (70 percent protein), 2.5 percent distillers dried solubles, 1.25 percent dehydrated cereal grass, 0.5 percent iodized salt, 1 percent limestone, 0.015 percent manganese sulphate, 0.25 percent feeding oil (2250A-300D per g.), and 0.05 percent nicarbazine. Cholesterol and the stabilized tallow or the oils were added to the

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 ABSTRACTER: Martin Heerdt

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arachidonate, eicosapentaenoate, and cod docosahexaenoate were readily oxidized.

Cysteine, Cu^{++}, and the supernatant derived from the mitochondrial separation were found to be slightly stimulatory to the oxidation; added coenzyme A, flavine adenine dinucleotide, glutathione, cocarboxylase, Fe^{++}, Mn^{++}, and Zn^{++} were without effect. Diphosphopyridine nucleotide and ethylenediamine tetraacetate were slightly stimulatory to mitochondrial preparations derived from a homogenate prepared with plain sucrose, but if the homogenizing medium contained disphosphopyridine nucleotide and ethylenediamine tetraacetate the stimulatory effect was no longer observed. Lipoic acid was inhibitory to the oxidation.

Adenosine diphosphate or adenylic acid could replace adenosine triphosphate in the system; the simultaneous use of two of these adenylate compounds in the system was slightly stimulatory. The addition of hexokinase plus glucose was without effect. Malonate and 2,4-dinitrophenol effectively inhibited the oxidation.

Acetoacetate was produced in less than theoretical amounts from the oxidation of octanoate and particularly from the oxidation of linoleate. This is probably due to the diversion of a portion of the fatty acid carbon into the tricarboxylic acid cycle.

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basal diet in concentrations of 1 percent and 10 percent by weight, respectively. New Hampshire cockerels were maintained for 1 week on the basal diet and then placed on a supplemented diet and water ad libitum in groups of 20 in separate cages. After 7 days and again after 13 days on the supplemented diets, the cockerels were bled from the wing and 0.5 ml. of blood was collected from each cockerel. The blood from four cockerels was pooled to give a sufficient quantity for the cholesterol determinations, which were carried out by the method of Zlatkis, Zak, and Boyle.

Results.--The tallow and oils used to supplement the diets of the cockerels were assayed. Corn oil, tallow, crude herring oil, and lingcod-liver oil contained only a small amount of unsaponifiable matter; whereas halibut, ratfish, dogfish, and basking shark-liver oils contained large amounts of unsaponifiable material. Some of the oils consisted mainly of triglycerides, whereas others also contained large amounts of squalene or glyceryl ethers.

The addition of 1 percent cholesterol to the basal diet produced hypercholesterolemia in the cockerels after they had been on the diet for 7 and 13 days. These hypercholesterolemic chicks were used as controls for diets supplemented with the fat and oils because the latter diets also contained 1 percent cholesterol

Diets supplemented with lingcod-liver oil and halibut-liver oil significantly decreased the blood serum cholesterol level of the cockerels to less than that of the controls after 7 and 13 days, respectively. Diets supplemented with tallow, corn oil, and crude herring oil all provided about the same significant increase in blood serum cholesterol levels. Ratfish-liver oil, dogfish-liver oil, and basking shark-liver oil did not decrease or increase the cholesterol levels as did the other oils. Oils from the teleostei or bony fishes (lingcod and halibut)--but not from herring--significantly lowered the blood cholesterol content; whereas the oils from the cartilaginous fishes (ratfish, dogfish, basking shark) had a much less pronounced effect.

3.5

nitrosomyoglobin is the second important role of curing. The extent to which the original myoglobin is changed into nitrosomyoglobin is a measure of the efficiency of the curing process. The amount of myoglobin in the fresh meat, however, limits the maximum color obtainable during curing and processing.

In traditionally cured uncooked bacon, 30 to 40 percent of the myoglobin is usually converted into nitrosomyoglobin. After low temperature smoking, this amount will increase somewhat to 40 to 50 percent. High-temperature smoking to 150° F. and over causes an appreciable increase in nitrosomyoglobin, and 60 to 80 percent of the myoglobin may be converted into the nitroso form. After cooking, values of 85 to 95 percent are usual in both cases.

In the final product, after curing and cooking, the nitrosomyoglobin is subject to oxidation by the air and to the formation of yellow-brown colored met-myoglobin. The amount of discoloration or fading is directly proportional to the intensity of light and to the duration of exposure.

Nitrite.--The pigment of cured meat is formed from the pigment of fresh meat by reaction with nitrite. In traditional curing, this nitrite is made available by the action of bacteria on the nitrate in the brine. Nitrite is currently being added to both pumping and tank brines. The addition of nitrite lends itself to more rigid control and, being independent of maturation, a new brine is as efficient as an old one. Only 5 to 10 p.p.m. of nitrite is actually needed to combine with the myoglobin of pork.

Since a large part of the conversion of pigment occurs during cooking or high-temperature smoking, a small but definite reserve of excess of nitrite must be available to carry through to the cooking stage. Generally, a value of approximately 50 p.p.m. of nitrite in the fresh cured meat or meat product is regarded as satisfactory. Nitrite in the presence of nitrate also has some bactericidal properties.

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Seven men subsisted for 6 weeks on diet AL and then for a second period of 6 weeks on diet IL. A second group of seven similar men subsisted for 6 weeks on diet IL and then for a second period of 6 weeks on diet AL. In like manner, two matched groups of seven men each subsisted on diets AM, American moderate fat, and IM, Italian moderate fat, which corresponded to diets AL and IL except that total fats provided 31 percent of the calories.

Results.--Serum cholesterol averages were 16 mg. per 100 ml. lower on diet IL than on diet AL and 19 mg. per 100 ml. lower on diet IM than on diet AM. These differences were statistically highly significant. Gas chromatograph analysis of the extracted mixed fats from the diets as fed indicated equality of polyunsaturated fats in diets AL versus IL and in diets AM versus IM. Diets IL and IM, however, provided slightly higher amounts of saturated fats in comparison with diets AL and AM. These fat differences would, of themselves, produce slight serum cholesterol differences (about 3 mg. per 100 ml.) in the direction opposite to that observed. The authors concluded that sucrose and milk sugar tend to produce higher serum cholesterol values than equal calories of carbohydrates contained in fruits, leafy vegetables, and legumes.

4.91 STUDIES ON THE DISTRIBUTION OF LIPIDES IN HYPERCHOLESTEREMIC RATS. 1. THE EFFECT OF FEEDING PALMITATE, OLEATE, LINOLEATE, LINOLENATE, MENHADEN AND TUNA OILS

Peifer, James J.; Janssen, Frank; Ahn, Philip; Cox, William; and Lundberg, Walter O. (University of Minnesota, Austin)
Archives of Biochemistry and Biophysics 86, 302-308 (February 1960)

Introduction.--A number of investigators have demonstrated that certain unsaturated dietary fats will lower the blood lipides of human subjects and of experimental animals. This effect may be correlated with (1) the concentration of essential fatty acids; (2) the nonsaponifiables in the fat; (3) a deficiency of nonessential unsaturated fatty acids; or (4) with the total unsaturation of the dietary fat.

Experimental.--The present paper deals with the comparative dietary effects of essential fatty acids, nonessential unsaturated fatty acids, saturated fatty acids, and of fish oils on the levels of cholesterol in the plasma of hypercholesteremic rats. Tuna and menhaden oils also were included because these fish oils have a low essential fatty acid activity, and they are a rich source of highly unsaturated fatty acids. Also reported here are the changes in the distribution of lipides in heart and liver tissues that accompany shifts in the cholesterol levels of the plasma. This information may lead to a better understanding of the mechanism(s) concerned with the development and disappearance of hypercholesteremia.

Methods.--Male, Sprague-Dawley rats, weighing 100 to 140 gr. each, were made hypercholesteremic by feeding a diet that contained 10 percent beef tallow, 0.5 percent cholesterol, and 0.5 percent ox bile. The hypercholesteremic rats were then randomly distributed into seven groups of seven animals each. Rats in six of the groups received diets in which a test fat was substituted for one-third of the dietary tallow. Rats in the seventh, or control group continued on the diet that contained

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 ABSTRACTER: Martin Heerdt

6.132 VISCERAL MEAL

Anonymous
Trade News 12, 13-14 (December 1959)

Visceral meal is made from fish entrails after the livers have been removed because they are more valuable for other purposes. This meal has been produced at the Fishery Technology Station of the Fisheries Research Board of Canada at Halifax, Nova Scotia, in its continuing search for ways to utilize the waste products of fish.

Visceral meal is high in protein and contains all of the essential amino acids and the vitamins that are necessary for good nutrition. Viscera represent about 15 percent of the total weight of the fish. The operation required to produce the meal is simple. The viscera are stored in a tank with an added preservative to prevent bacterial decomposition. The enzymes that are present in the viscera break them down and transform them to a liquid state. The liquid then is dried on a drum drier and a dark, cream-colored coarse powder is the resultant product.

Visceral meal does not taste of fish but is reminiscent of bouillon. Under present conditions it cannot be considered suitable for human consumption.

It is reported that the reason such a readily available material as cod and haddock viscera had not previously been used by the byproducts industry is that no convenient means of handling and processing was available. The processing methods developed at the Halifax laboratory probably have overcome this problem and the way may now have opened for the economic use of this material.

 ABSTRACTER: Kathryn L. Osterhaug

6.132 MULTI-PURPOSE PLANT HANDLES BOTH 'TRASH FISH' AND MENHADEN

Renneburg, John N.
Fish Boat 4, 39-41, 46 (December 1959)

The need for more effective utilization of the so-called "trash fish" opens the door for an entirely new and heretofore almost untouched source of raw material for fish-reduction operations. We are referring to the catch of croakers, blow fish, toad fish, sea robbins, occasional silver eels, and many other species that are caught along the Atlantic and Gulf Coasts by the shrimp boats, and that are for the most part usually thrown overboard again after the shrimp are separated. Several plants for processing these species have recently been set up in the Mississippi and Louisiana areas and are operating successfully.

During the spring of 1958, the necessity of helping the depressed shrimpers in the Morgan City, Louisiana, area by providing means of utilizing the trash fish normally thrown away, was recognized. It seemed logical to design a plant that would offer the flexibility necessary to produce a wide range of fishery products. Because "trash" or industrial food fish normally contain insignificant amounts of oil they can be fed into one, single-pass combination cooker-dryer unit from which they are discharged as whole body meals ready for bagging and shipment. Desirable as this would have been from the standpoint of lower capital expenditure, it was recommended that the operation at Morgan City be broadened to include the processing of menhaden.

The engineers went to work to design a plant capable of handling both trash fish and menhaden at the rate of 20 tons per hour and permitting extreme product flexibility--namely, conventional fish meal, oil, and concentrated fish solubles (principally from menhaden); conventional trash-fish meal and solubles; whole trash-fish meal; and liquid fish (sometimes referred to as condensed homogenized fish). In order to expedite simultaneously the unloading of both the trash fish and menhaden, two

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 ABSTRACTER: Kathryn L. Osterhaug

6.135 FUME GOBBLER PAYS EXTRA BENEFITS

Anonymous
Food Engineering 31, 65-66 (December 1959)

Introduction.--Does your operation pose a fume problem--smoke and gases from roasters, cookers, or fryers exhausted to the outside air and irritating noses and eyes? Turning neighbors against you and involving brushes with local law enforcement agencies?

If you face such complaints, then a pertinent move worth weighing is installation of catalytic heaters to eliminate the fumes. Particularly notable is the high success these units are now enjoying.

Using catalytic units for a dual function--both to supply heat and to consume exhaust fumes--is a hard combination to beat. Moreover, some food firms report very specific reductions in process and maintenance costs.

Thus, a West Coast company recovers heat from its rice-browning operation while burning up exhaust gases and chaff. End products of the catalysis are inoffensive odor-free and color-free gases that directly disperse in the air.

A unit in a Southwest corn-chip plant, installed following complaints, quickly won approval of local authorities. Here fumes are consumed by hood exhausters over continuous fryers, thus preventing fouling of the air. Moving to another industry branch, a system in a lard refinery handles, through a manifold arrangement, water vapor and odorous constituents in exhaust from a number of dry-fat renderers. Further, satisfactory pilot runs have been made on exhaust from potato-chip fryers.

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separate fish-pump unloading stations were installed. The fish are discharged by gravity into a four-compartment steel-insulated and covered raw box. Each compartment holds approximately 175 tons of fish. A 60-ton freon refrigeration system circulates chilled water through the fish, maintaining a constant fish temperature of approximately 38° F.

The latest type 42-inch diameter by 30-foot long continuous indirect cooker was selected for the cooking operation. Weighing over 30,000 pounds, this unit is equipped with a new kind of internally heated screw used in combination with a steam-jacketed shell that provides adequate heating surface for properly cooking large quantities of fish. Because the fish were chilled and kept in a firm condition, provision was made to shred and macerate the raw material into small pieces in a prebreaker placed ahead of the indirect cooker to assure better heat transfer.

After predraining the liquids from the cooker, the material was pressed in a continuous 12-foot multi-stage press that was equipped with a four-stage screw and stainless-steel screens. The centrifuge that was selected permits a three-way split--oil, stickwater, and solids for mixing with the press cake to increase the yield of meal. Before entering the centrifuge, the press liquids were pumped over a 48-inch vibrating screen to remove the larger solids. A small settling tank was also used to remove sand and other abrasives.

Gentle drying of the press cake was effectively accomplished in a 40-foot-long, single, one-pass shell dryer that changes the velocity of the air and solids as they travel through the unit. The small, 6-inch diameter throat at the feed end, where the heated air and the temperature-sensitive fish meal enter, moves the material quickly through the hot zone where the surface moisture is "flashed off" in an instant. As the product moves into the larger diameter sections, its speed is decreased.

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Leading food-field interest, however, has been displayed by coffee people, long interested in abolishing roaster odors (see "Catalyst Curbs Air Pollution," FE Aug. '53, p. 63). Here, work is now underway on direct flame burning of roaster-exhaust gases.

Other groups showing special interest are deep-fat fryers of fish and people who process animal feeds from various materials (as fats, fish wastes, and chicken entrails).

Although elimination of air pollution has been the primary objective of many initial catalytic installations, there is also emphasis on heat recovery. Trend toward catalytic heat recovery has undoubtedly been influenced by efforts of the management of gas utilities, who are tipping off their customers on means for more effective and economical use of gas fuel.

Flameless burning.--The heart of the equipment is the catalyst. Employed are crimped high-nickle alloy ribbons laid random fashion in standard-size channel frames and electrolytically coated with a high-temperature-activated catalyst (platinum alloy with precious metals). The frames, which lie on an asbestos gasket supported by angle irons, are easily removed for maintenance and for periodic washing to remove inorganic residues.

Combustion takes place when fumes, regardless of dilution, are exposed to the corrosion-resistant catalyst at suitable temperatures. In fume control, the exhaust flow is first preheated by gas or electricity (500° to 700° F.), then is forced through a blower to be oxidized on the surface of catalyst (without flame) to CO_2 and water vapor. In effect, the catalyst at low-temperature "burns" gases even when their concentrations are far below the lower level of flammability.

Oxidation is exothermic (heat-liberated) as gases pass at up to 500 feet per minute through the catalyst. This clean heat is returned to the system to preheat fresh fumes coming from the process. Once operating, the output of the preheat burner is reduced, the extent depending on the amount of catalyst-released heat acquired from the fumes. High fume concentrations result in better efficiency, lower operating cost.

The catalyst doesn't enter into the oxidation reaction. Its theoretical life is, therefore, limitless. In practice, however, it doesn't quite work that way. With fume streams essentially free of inorganic matter, catalytic units have piled up over 24,000 hours without requiring service. When a catalyst does require replacement, it is done on a simple exchange basis.

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tallow as the only fat.

Results.--Tuna and menhaden oils provided the most rapid and significant reduction in plasma cholesterol, whereas linolenate provided a less rapid, but equally effective action. Rats that received linoleate, the test fat ordinarily considered to have the greatest essential fatty acid activity, showed a significant but less marked reduction of their plasma cholesterols than did rats that received the fish oils or those that received linolenate. Rats that received oleate showed a transitory rise in plasma cholesterol, whereas rats that received tallow (controls), palmitate, or oleate had equally high plasma cholesterols at the end of the test period. The depression of plasma cholesterol in hypercholesteremic rats therefore appears to be best correlated with the total unsaturation of the dietary fats.

Rats that received fish oil and rats that received linolenate showed the greatest reduction in plasma cholesterols and the greatest accumulation of pentaenoic and hexaenoic acids in their hearts. Although the rats that received linoleate had the greatest accumulation of linoleic (diene) and arachidonic (tetraene) acids in the heart, they showed a less marked depression of cholesterol in their plasma lipides during the test period. The combined concentration of pentaenoic and hexaenoic acids was comparatively low in all rats except those that received fish oils or linolenate. Studies of heart polyenes revealed no apparent simple relationship between the observed changes in plasma cholesterol and any of the following: (a) the concentrations of dienoic and tetraenoic acids, (b) the total unsaturation of the polyenoic acids present, (c) the combined concentration of tetraenoic, pentaenoic, and hexaenoic acids, and (d) the existence of a mild essential fatty acid deficiency. The main point of interest therefore was a high concentration of pentaenoic and hexaenoic acids in the hearts of the rats that showed the larger decrease in plasma lipides.

Observed changes in tissue lipides were not related to any apparent differences in the rate of growth of the rats or to their utilization of calories derived from the test fats.

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6.135 RESEARCH SNUFFS SMELLS

Anonymous
Research and Development 11, 76-78 (January 1960)

Introduction.--Odor measurement depends upon the human nose, which is the only known device that is regarded as accurate. For one person to know for certain what another is smelling is not always possible. Some people may suffer from parosmia, a condition that causes everything to smell bad, or from anosmia, an inability to smell. Because of these limitations, the nose is a poor scientific instrument, but an excellent guide to operating generalizations.

R. W. Moncrieff, Scottish physicist and authority on odor, has assisted in the development of techniques of quantitative and qualitative odor measurement. One of Moncrieff's experiments may lead to the development of a synthetic nose. He has discovered that different sections of the nose absorb different odor particles. This characteristic enables the nose to distinguish one odor from another. Moncrieff hopes to develop equipment that will be better than the human nose for evaluating an odor by using materials with different capacities for absorbing odors obtained from specimen samples.

Instruments for odor research.--The Multi-Stimulus Olfactometer delivers one pure odor, or a combination of up to three odors. This instrument permits an evaluation and comparison of odors. As a unit, it allows testing of up to four different odor stimuli or various combinations under predetermined conditions of temperature, concentration, air dilution, and air impingement velocity. The metering part consists of one air tank that is used to supply air through a needle valve and pressure gauge for dilution of odorized air and a second tank that is connected to a manifold which supports a pressure gauge and four micrometer needle valves for metering air to various odor-generating flasks. The flasks contain odors and gas bubblers to achieve maximum liquid-to-gas contact. The tubing goes

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 ABSTRACTER: Martin Heerdt

6.85 IMPROVED FISH GLUE

Anonymous
Trade News 12, 15 (November 1959)

Among the more important projects of the Halifax, N. S., Technological Station of the Fisheries Research Board of Canada are those concerned with the utilization of the waste materials of fish. Scientists working on these projects are finding not only new ways to use former wastage, but also are improving the quality of byproducts already developed.

In the latter category is the improved quality of glue extracted from fish skins. Although utilization of fish skins for glue did not originate with the Halifax station, research workers there have turned out a product that appears to be superior to most fish glue on the commercial market.

The procedure used by fish glue manufacturers at present results in a product that varies in colour (various shades of grey) and has a fishy smell. Samples examined at the Halifax station had the odor of phenol, which had been probably used as a preservative. Although the factory-made glues had a good adhesive strength and all other qualities that characterize a good interior adhesive, some of them had one quality that would not recommend them to the average user--the smell of fish.

To produce a glue product that was attractive to look at, without an unpleasant odour and with the necessary adhesive qualities, was the primary aim of this Halifax research project. Secondary objectives were the production of additional byproducts from the skins.

Experiments carried out were mostly on fresh skins from cod, haddock, pollock, hake, and sole that had been removed from fillets in fish plants. Some experiments were carried out using cod and and pollock heads. No work was done on salted skins, bones, trimmings or other waste material.

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6.15 CONDENSED FISH SOLUBLES. A REVIEW OF ITS PREPARATION AND PROPERTIES

MacLeod, Robert A. (Fisheries Research Board of Canada, Technological Station, Vancouver, B. C.)
Journal of the Fisheries Research Board of Canada 16, 685-692 (October 1959)

Introduction.--Because of the considerable current interest in the use of condensed fish solubles as a source of growth-stimulating factors in rations for poultry, the authors felt that a summary of information regarding the preparation and properties of this product would be of interest.

Source.--Condensed solubles is a product obtained by the treatment and concentration of fish stickwater. Fish stickwater is a byproduct in the production of fish meal by the wet-reduction process (Tressler and Lemon, 1951). In this process, the fish are cooked and then pressed. The press cake is dried and becomes fish meal. The press liquor, which contains both oil and a water solution of some of the soluble components of the fish, is separated into oil and water phases either in settling tanks or by centrifugation. The water phase or stickwater contains 5 to 7 percent total solids, about 1 percent insoluble solids, and 1 to 2 percent oil. About one-half of the total solids, or 2.4 to 3.5 percent depending on the season and other factors, is nitrogenous material. Of the latter, about 8 percent is true protein, and the remainder is composed of smaller molecules (Beall, 1934). From 16 to 26 percent of the total protein of the original fish and a very large proportion of the water-soluble vitamins can be recovered in the stickwater (Klungsøyer et al., 1954).

Recovery of the stickwater.--For many years stickwater was discharged into the sea as a waste product. When the value of stickwater as a source of nutrients was realized, attempts to recover it were made. Efforts to concentrate stickwater to a product with a high solids content were generally unsatisfactory because the proteins present caused the formation of a gluey viscous product. The effects of this protein were largely overcome in 1945 by Lassen, who coagulated the proteins by

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 ABSTRACTER: Martin Heerdt

7.80 GLOSSARY OF SOME TERMS USED IN THE SENSORY (PANEL) EVALUATION OF FOODS AND BEVERAGES

Kramer, Amihud
Food Technology 13, 733-736 (December 1959)

Introduction.--The first objective of the Committee on Taste Testing (1958) of the Institute of Food Technologists was "To bring order out of chaos." The committee therefore undertook to develop a glossary of 85 terms all of which are subject to constructive criticism. This glossary will serve as: (1) a guide to students and investigators beginning work in this field and (2) an authoritative reference for the use of these terms. Typical examples of the terms are as follows:

Difference test.--A comparison or test of quality variations without indication of preference.

Dual standard method of difference testing.--Two samples are identified and presented first as knowns, then they are given again as unknowns for the observer to identify.

Duo-trio method of difference testing.--One of a pair of samples is identified and presented first, then the observer receives two more samples as unknowns in random order. The time interval can be varied as desired. The observer's task is to pick the different sample.

Flavor profile technique.--A method of qualitative description analysis of aroma and flavor. The method makes it possible to indicate degrees of difference between two samples on the basis of individual character notes, the degree of blending, and the overall impression of the product.

Hedonic.--Pertaining to feeling or feeling tone; hedonic tone is the pleasurable or unpleasurable accompaniment or characteristics of conscious experiences.

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 ABSTRACTER: Martin Heerdt

DEODORIZING ODORS

CONDENSED FISH SOLUBLES

FISH GLUE

TERMINOLOGY FOR SENSORY EVALUATION

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acidification. The coagulated material was removed by centrifugation and added to the press cake for drying into fish meal. After recovery of residual oil released by the acid treatment, the supernatant liquid was concentrated by multiple effect evaporation to a product called solubles. This product contains about 50 percent solids. Many plants acidify stickwater merely as a preservative measure and concentrate the product without removing the coagulated protein. The presence of these solids in the final product in varying amounts contributes greatly to the variation in the physical properties of the resulting preparations.

In 1948, Gunther and Sair converted the proteins present in the original stickwater to smaller fragments by the action of proteolytic enzymes found either in natural fish enzymes or commercially available proteolytic enzyme preparations. Condensation of the enzyme-treated stickwater to a product with a high solids content could then be effected without difficulty. Efforts to convert condensed solubles to a dry product have met with little success. The product is excessively hygroscopic, which causes many difficulties in its manufacture (Lee, 1956).

Nutritional value of solubles. -- The vitamin B_{12} content of herring stickwater and of the condensed solubles prepared from it demonstrates the fact that the vitamin B_{12} content of condensed solubles, which is about 0.4 milligrams per pound on a dry weight basis, is almost invariably about 25 percent less than that of the stickwater from which it is produced. The essential amino acid content of condensed herring solubles has been reported (Ney et al., 1950). Work by Lassen, Bacon, and Dunn (1949) showed that putrefaction may result in a general decrease in the total content of the individual amino acids with increasing spoilage of the stickwater from which the solubles was prepared.

Stickwaters prepared from fresh herring and from herring after 31 days in storage were found to contain, respectively, 16 percent and 26.4 percent of the total protein in the fish. Stickwater from stored herring contained 74 percent of the pantothenic acid, 63 percent of the niacin, 56 percent of the riboflavin, and 52 percent of the vitamin B_{12} found in the original fish (Klungsøyer et al., 1954).

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either to one or more mixing chambers where vapors are mixed or diluted with fresh air, and then to the sniffing tube for air evaluation of the odors. Flowmeters are used to check and standardize gas flow.

Another instrument, the Osmometer, employs two calibrated air-pressure chambers attached to a manometer for recording pressure. Odorless air, which is charged into one or both cylinders at measured pressure, is gradually bled into a flask containing saturated vapor above the test material. A certain amount of odorless air is used to replace a similar quantity of saturated air in 2-l. Erlenmeyer flasks. These flasks are prepared for studies to judge the dilution at which an odor is perceived.

Industrial research. --Special equipment has been developed to simulate process or stack odors for use in studies to determine the effectiveness of odor counteractants. Industrial odors require much preliminary work to develop a formula that will control their components. Some components of industrial odors disperse rapidly beyond the limits of perception, whereas other components are tenacious and do not disperse rapidly.

Smoke odor service is a specialty that has enabled firms threatened with major losses to salvage their property. All traces of smoke odor can be removed from some materials by treatment with solutions of volatile solvents. Industrial odor treatment is the result of an interest in extending the usefulness of the basic idea of odor opposites by matching the vaporization rates of odor counteractants with the vaporization rates of the odoriferous wastes. Treatment of waste and stack odors for industry also has resulted in a study of air distribution patterns.

Olfactory observations. -- Three 5- by 8-foot rooms completely sealed and sheathed with formica are used for olfactory judgments. Each room has a one-way observation window as well as centralized controls to permit complete control over temperature, humidity, supply of test odors, and counteractants.

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Multiple comparison. -- An unlimited number (usually more than three) of samples is presented to the observer simultaneously in random arrangement or in accordance with a predetermined statistical design.

Paired comparison method. -- A psychometric or psychophysical method in which stimuli (samples) are presented in pairs for comparison on the basis of some designed criterion, such as preference, or intensity of a defined quality.

Rank order. -- A psychometric method that may be used in multiple comparisons where the subject considers all of the samples on a series at the same time and is required to rank them in order on some designated dimension, such as preference intensity, or quality.

Threshold or limen. -- A statistically determined point on the stimulus scale, at which occurs a transition in a series of sensations or judgments. Thresholds are of three kinds: (1) The threshold of sensation, stimulus threshold, or absolute threshold, often designated as RL, which is that magnitude of stimulus at which a transition occurs from no sensation to sensation. (2) The difference threshold, the least amount of change of a given stimulus necessary to produce a noticeable change in sensation. It is often designated as the DL and the interval or unit as the j.n.d. (just noticeable difference). (3) The terminal threshold, which is that magnitude of a stimulus above which there is no increase in the perceived intensity of the appropriate quality for the stimulus (above this point pain often occurs).

Triangle method of difference testing. --The test unit consists of three samples. All three are coded so that they are unknown, but the observer is told that two are alike and one is different. It is his task to pick the different sample.

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Cod skins were found to be most adaptable because they are thicker and the yield of glue is higher.

Various procedures were used before the most satisfactory method was established. The final result was a honey-colored and practically odorless product having the same high binding strength as commercial fish glues. In addition to the liquid form, the glue was also produced in the alternative solid form, which has many advantages for the producer and the consumer as well. First of all, the dried glue can be ground to any particle size. The dried material is not hygroscopic, does not need glass or metal packaging, does not spoil by contamination, has an unlimited shelf life, and costs less to transport. For the consumer it is easy to use in any concentration he may prefer.

With the extraction of the glue from the skins, three byproducts were left that may have a potential when they are secured from fresh and unspoiled skins and when spoilage is prevented during production. The byproducts are: guanine, enzymic protein hydrolyzate, and fertilizer.

Although only 0.1 percent of the weight of the original skin is recovered as guanine salt, the market price of about $75 a pound for the product lends an attractive aspect. No extra equipment is needed to extract this salt.

The enzymic protein hydrolyzates that are found in the residue after the glue has been extracted are usually added to the fish meal. It has been suggested, however, that a better and more profitable use of those proteins could be made if they were converted into a water-soluble, partly hydrolyzed product. The preparation could be used as the raw material in pharmaceutical products combined with iron, iodine, and calcium, or as a peptone for the preparation of culture media in laboratories and industries.

The residue from the dried skin after the glue and guanine have been extracted is well suited as a garden fertilizer. It is more appropriate for this purpose than fish meal because it has no repulsive odor and has a high content of calcium phosphate and organic nitrogen.

7.874 A DISTILLATION METHOD FOR THE QUANTITATIVE DETERMINATION OF MALONALDEHYDE IN RANCID FOODS

Tarladgis, Basil G.; Watts, Betty M.; and Younathan, Margaret T. (Florida State University, Tallahassee); and Dugan, Leroy, Jr. (American Meat Institute Foundation, Chicago, Illinois)
Journal of the American Oil Chemists' Society 37, 44-48 (January 1960)

Introduction. --One objective test for following organoleptic deteriorations in food products is the reaction of 2-thiobarbituric acid with the oxidation products of unsaturated fatty acids to give a red pigment. Sinnhuber et al. (1958) prepared this red pigment both from malonaldehyde and from rancid oil. On the basis of elemental analyses, absorption spectrophotometry, and paper chromatography, these investigators concluded that pure pigments from the two sources were identical. They also suggested a structure in which two molecules of 2-thiobarbituric acid condense with one of malonaldehyde.

2-Thiobarbituric acid may be added along with a strong acid directly to the food. This mixture then is heated for periods of 30 to 50 minutes to obtain maximum color development, and the red pigment formed during the heating is extracted with a suitable solvent. Turner et al. (1954) treated pork tissue with 2-thiobarbituric acid in the presence of phosphoric and trichloroacetic acids and extracted the color with an isoamyl alcohol-pyridine mixture. Yu and Sinnhuber (1958) heated fishery products with 2-thiobarbituric acid in the presence of hydrochloric acid, trichloroacetic acid, and pyridine and then extracted the chromogen with petroleum ether. Sinnhuber and Yu (1958) proposed the use of 1,1,3,3-tetraethoxypropane as a standard. Acid hydrolysis of this acetal yields malonaldehyde, therefore, they were able to express their results in terms of a 2-thiobarbituric acid number defined as milligrams of malonaldehyde per 1,000 grams of sample.

Purpose. -- The research reported in this paper describes the application of the distillation procedure to meat and compares this method with Turner's extraction method. The distillation technique

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 ABSTRACTER: Martin Heerdt

8.51 MULTIPLE HAEMOGLOBINS IN FISH

Chandrasekhar, N. (Biometry Section, Indian Statistical Institute, Calcutta, India)
Nature 184, 1652-1653 (November 21, 1959)

Introduction. -- Although various investigators have reported on the concentration of haemoglobin in different species of fish, no information seems to be available in the literature about haemoglobin patterns of fish. This communication deals with the findings on the blood samples of 10 different species of fresh-water fish: Catla catla, Labeo rohito, Cirrhina mrigala, Labeo calbasu, and Labeo bata (family Cyprinidae), Ophicephalus punctatus Bloch and Ophicephalus striatus Bloch (family Ophicephalidae), Heteropneustes fossilis (family Heteropneustidae), Clarias batrachus (family Claridae) and Tilapia mosambica (family Cichlidae). After this note had been prepared, a report (Buhler and Shanks, Science 129, 899 (1959)) on the occurrence of multiple haemoglobins in some species of fish has appeared.

Experimental. --Blood samples were obtained direct from the heart, after dissection of the live fish, into clean heparinized tubes. Blood haemolysates were prepared and the analysis carried out by the agar electrophoretic technique. The haemoglobin bands appeared blue on staining with amido-Schwarz. The bands, immediately after electrophoresis, were tested with the benzidine reagent and were confirmed as haemoglobins. The samples which showed the presence of more than one haemoglobin were analysed by use of a photovolt densitometer (Photovolt Corporation model 52-C) to evaluate the percentage distribution of the different components. Photographs of typical electrophoretic patterns of the fish blood samples are presented as well as the number of haemoglobins and the percentage distribution of the different haemoglobins in each of the ten species of fresh-water fish investigated.

The blood of O. punctatus contains three haemoglobins, the blood of C. catla, L. calbasu, L. bata and T. mosambica two, and the blood of the other five species only one each. All the five species

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7.89 RELATION BETWEEN HYDROXYPROLINE OF ALKALI-INSOLUBLE PROTEIN AND TENDERNESS OF BOVINE MUSCLE

Loyd, E. Jean and Hiner, Richard L. (U. S. Department of Agriculture, Beltsville, Maryland)
Journal of Agricultural and Food Chemistry 7, 860-862 (December 1959)

For many years food technologists have tried to separate the connective tissue of meat, measure it, and demonstrate its relationship to the tenderness of the neat. Since 1950, the determination of the amino acid hydroxyproline by the method of Newman and Logan has been accepted as the most accurate index of connective tissue in biological materials.

The objective of the investigation reported here was to determine whether or not a relationship exists between the hydroxyproline content of the alkali-insoluble protein of the muscle and the tenderness of the meat.

The assays of hydroxyproline were made on the protein that remained undissolved after muscle samples had been digested twice in 0.1 N sodium hydroxide.

Experimental. -- Tenderness of the muscles of veal animals was measured by the Warner-Bratzler shear. The tenderness of 11 muscle samples was also measured by the meat-tenderness pressure method introduced by Sperring, Platt, and Hiner in 1958. The Longissimus dorsi muscles that were used for the measurement of tenderness were aged for 10 days and then frozen until the time of analysis. All separable fat and connective tissue were removed from the samples of meat before they were analyzed for hydroxyproline.

Results. --The mean hydroxyproline content of duplicate samples of five beef Semitendinosis

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 ABSTRACTER: Kathryn L. Osterhaug

9.4 FOOD IN RUSSIA

Cutting, C. L. (Humber Laboratory for Research in Fish Technology, Hull, England)
Food Manufacture 35, 18-22 (January 1960)

Introduction. --Russia--next to Japan--catches the world's second largest quantity of fish, which presently totals about 30 million tons a year. Russian trawlers, with a capacity of 100 to 600 tons, land fish that have been held for as long as 15 days in ice, although 12 days in ice is more normal. This fish is graded and allocated by government inspectors under the direction of the Ministry of Trade. Sensory standards supplemented with physical and chemical tests are used in grading. Fish that will not stand further transportation by rail to reasonably accessible centers of population are salted.

Freezing and storage. -- In 1956, 428,000 tons of fish were frozen in Russia. Of this amount, about 50 percent was frozen on board fishing vessels and floating factoryships. Most frozen fish is stored at 0° C., although new cold storages are equipped to hold a temperature of -22° F. to accommodate the storage of frozen fatty fish. Moscow has a 35,000-ton-capacity jacketed cold store that has reduced dehydration by 50 to 60 percent.

Transport. -- For moving frozen food, Russia has 1,500 mechanically refrigerated cars that provide temperatures as low as -12° C. Diesel-electric compressors are used in these cars to circulate brine through pipes as a secondary refrigerant. Russia also uses 27,000 ice-and-salt refrigerated cars for moving frozen foods. Water ice that is used in these cars is made by a mechanized process at the rate of 20 million tons annually.

Fish processing. -- Fish are processed in Moscow at a large, central factory that employs 2,000

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 ABSTRACTER: Martin Heerdt

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muscles was 0.42 g. per 100 g. of fat- and moisture-free tissue; and the mean value of duplicate runs on three Semitendinosis muscles of veal was 0.39 g. per 100 g.

The hydroxyproline content of duplicate runs on 16 Longissimus dorsi muscles of beef ranged from 0.37 to 0.104 percent with a mean of 0.063 percent of fresh meat.

The correlation between tenderness as measured by mechanical shear and taste panel and the sum of the hydroxyproline contents of two fractions is compared with the correlation between tenderness and the sum of the hydroxyproline contents of three fractions. The correlation between hydroxyproline and mechanical shear is improved by the addition of the fat fraction, but both correlations are significant. The correlation between hydroxyproline and taste-panel rating is significant for the total of collagen and elastin fractions, but it becomes highly significant with the addition of the fat fraction. This raises the coefficient of determination ($r^2 \times 100$) from 66.28 to 76.88 percent in the relation of hydroxyproline to mechanical shear; and from 48.46 to 67.74 percent in the relation of hydroxyproline to taste-panel rating.

9.4 (Cross Reference: 1.0145)

workers and that produces 400 tons of processed fish per day. This fish is distributed daily to retail fish shops and food stores. Fish are also processed in a large factory at Astrakhan that employs 5,000 workers per day.

Fish smoking.--The Moscow fish factory smokes a total of 60 tons daily of a variety of fish that range from Caspian sprats and Lake Baikal and North Sea herring to various species of sturgeon. All of the fish are smoked in primitive mechanical kilns that depend on air movement induced by a chimney fan or on a merry-go-round, in which the fish (sturgeon) travel around the kiln. Experimental, electrostatic-smoking plants are in operation at Kiev, Leningrad, and Astrakhan. As much as 800 pounds of small fish can be electrostatically smoked and infrared dried in 42 minutes. Also in operation on a pilot scale in the Moscow fish factory is a substitute dipping process for smoking that is followed by infrared drying. The dip solution for the process is obtained by scrubbing, concentrating, and washing the distillate from smoke.

Dehydration and canning.--Vacuum-cabinet dehydration is in commercial operation at Kaliningrad for Baltic cod and at Rostov for "Sudak," a small nonfatty fish. Many fish, including cod, are canned in floating and shore-based factories for home consumption. Crab and salmon are canned for export.

Education.--Three special institutes or high schools train highly qualified specialists for fish biology, fish catching, and fish technology. In addition, many technical schools, correspondence schools, and educational institutions train skippers and other personnel.

Research and development.--About 800 scientists and 1,200 aides are employed in biological, technical, and technological fisheries research under the All Union Institute for Fisheries and Oceanography. The technology section, which spends about 15 percent of the total budget, has 120 people. Including workers at other institutes, such as the Refrigeration Research Institute, some 500 people are engaged in fishery technological research.

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has been simplified somewhat by direct heating of meat slurries in Kjeldahl distillation racks rather than by passing live steam through the samples. Malonaldehyde standards have been used with both methods, as suggested by Sinnhuber and Yu (1958).

Procedure.--Blend 10 g. of meat with 50 ml. of distilled water in a Waring Blendor for 2 minutes. Transfer the mixture quantitatively into a Kjeldahl flask by washing with an additional 47.5 ml. of distilled water. Add 2.5 ml. of HCl solution (one part concentrated HCl to two parts of distilled H_2O) to bring the pH to 1.5. Place a small amount of Dow anitfoam A onto the lower neck of the flask, and add a few saddle stones to prevent bumping. Assemble apparatus and heat flasks at the highest heat obtainable on the Kjeldahl distillation apparatus and collect 50 ml. of the distillate.

Mix the distillate, pipette 5 ml. into a 50-ml. glass-stoppered tube, and add 5 ml. of 2-thiobarbituric acid reagent (0.02 M 2-thiobarbituric acid in 90 percent glacial acid). Stopper the tubes, mix the contents and immerse in a boiling water bath for 35 minutes. Prepare a distilled water 2-thiobarbituric acid reagent blank. Heat, cool in tap water for 10 minutes, transfer a portion to a cuvette, and read the optical density of the sample against the blank at a wave length of 538 mμ on a Beckmann DU spectrophotometer. Multiply the reading by the factor 7.9 to convert to milligrams of malonaldehyde per 1,000 grams of meat.

Results.-- Absorption spectra of the color produced with 2-thiobarbituric acid and the hydrolysis product of 1×10^{-3} M 1,1,3,3-tetra-ethoxypropane (malonaldehyde), using Turner's method and the method described above, were plotted. In addition, a spectrum of the chromogen produced by reacting the 2-thiobarbituric acid reagent with a distillate from rancid cooked meat was obtained. The shapes of the absorption curves are similar to those shown by Sinnhuber and Yu (1958). Maxima of 543 mμ were found by Turner's method, whereas maxima of 538 mμ were found by the distillation procedure.

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having multiple haemoglobins have a major component (α) and one or more minor components (β, γ). The haemoglobin components are designated as α, β and γ in the order of decreasing electrophoretic mobility. The α-components of all the species account for nearly 70 to 90 percent of the total haemoglobins, β and γ representing only a much smaller fraction. Even in the electrophoretic mobility, the different species exhibit appreciable differences. The major components of C. catla, L. rohito, C. mrigala, and L. bata have nearly the same mobility, whereas that of L. calbasu, O. punctatus, O. striatus, C. batrachus, H. fossilis and T. mosambica have a slightly higher mobility. All the components of fish haemoglobins have a low mobility similar to those of γ-globulins of human serum, or even lower.

The blood samples investigated are all from adult fish, and all members of the same species invariably showed a consistently similar haemoglobin pattern. This observation is of significance in the light of reports that tadpoles and adult frogs show slightly different haemoglobin patterns and that some species, like sheep and cattle, show a mixed pattern, some members having two haemoglobin components and others having only one. The haemoglobin patterns in fish do not seem to conform to any distinct family characteristic. Even within the air-breathing species there is significant heterogeneity in their haemoglobin patterns.

Table 1.--Total composition of the haemoglobins of fresh-water fish

Species	Component 1		Component 2		Component 3	
	Percent		Percent		Percent	
Catla catla	87.72	(±6.81)	12.29	(±6.81)		
Labeo calbasu	90.18	(±3.20)	9.83	(±3.20)		
Labeo bata	92.88	(±0.61)	7.12	(±0.61)		
Ophicephalus punctatus	70.67	(±5.64)	22.69	(±4.12)	6.63	(±2.59)
Tilapia mosambica	91.16	(±1.84)	8.84	(±1.84)		

0.112 FOOD COLORIMETRY: KEY TO QUALITY CONTROL. PART 1. AVAILABLE TOOLS

Livingston, Gideon E. (Continental Baking Co., Rye, New York)
Food Engineering 31, 74-77, 78 (March 1959)

0.113 UNBREAKABLE THERMOMETER FOR MEASURING THE TEMPERATURE OF FROZEN MEAT

Divakov, A. G.; Konarevskii, A. A.; and Voinova, P. A.
Vsesoyuz. Nauch.-Issledovatel. Inst. Myasn. Prom. Moskva, Trud. All-Union sci. Res. Inst. Meat Ind., Moscow, Rep. 5, 239-243 (1953)
Food Science Abstracts 29, 406 (October 1957)

An illustrated description is given of an electrical resistance thermometer, designed as a probe, which is used, in combination with a continuous recorder, for measuring the temperature of frozen meat.

0.30 BIOSYNTHESIS OF SQUALENE AND CHOLESTEROL FROM DL-β-HYDROXY-β-METHYL-δ-[2-^{14}C] VALEROLACTONE

Cornforth, J. W.; Cornforth, Rita H.; Popjak, G.; and Youhotsky-Gore, Irene (London, England)
The Biochemical Journal 66, 10p (May 1957)

0.30 BIOCHEMISTRY OF FISHES

Tarr, H. L. A. (Fisheries Technological Station, Vancouver, B. C.)
Annual Review of Biochemistry 27, 223-244 (1958)

The following subjects are reviewed: proteins, nonprotein, nitrogen, nucleic acids, and related compounds, phospholipids, enzymes, nutrition, and sterols of marine invertebrates. A total of 265 references are cited.

0.7 AMINO ACID REQUIREMENTS

Williams, Harold H. (Department of Biochemistry and Nutrition, New York State College of Agriculture, Cornell University, Ithaca)
Journal of the American Dietetic Association 35, 929-934 (September 1959)

0.7 AMINO ACID BALANCE AND PROTEIN REQUIREMENT

Harper, A. E. and Kumata, U. S.
Federation Proceedings 18, 1136-1142 (December 1959)

This article is a summary of the present status of information on protein requirement, unbalanced protein, and imbalance of amino acids. The amounts of indispensable amino acids present as well as the proportions in which they occur determine the efficiency of a protein. However, proteins with the same proportions of indispensable amino acids will have different efficiencies if the amounts present are different. Studies on experimental animals have shown that a diet with a poor amino acid balance can be inadequate to the point of causing depression in food intake and, consequently, in growth.

1.0111 ANNUAL REPORT OF THE FISHERIES RESEARCH BOARD OF CANADA FOR THE YEARS 1957-1958

Kask, J. L.
Annual Report of the Fisheries Research Board of Canada 1957-1958, pp. 13-17 (1958)

(Abstract of this article appears under 0.6 page 1 - September 1959)

1.0112 ALASKA--AND HER COMMERCIAL FISHERIES

Gharrett, John T. (Regional Director, Bureau of Commercial Fisheries, Alaska Region)
Fishing Gazette 77, 13, 57 (January 1960)

1.0113 PACIFIC COAST FISHING PORTS

Sanford, F. Bruce (U. S. Fish and Wildlife Service, Seattle 2, Washington)
Commercial Fisheries Review 19, 20-23 (April 1957)

Bay City, Oregon: Bay City is a small fishing community located on Tillamook Bay in northern Oregon. This article, which is one in a series of photographic reports on the fishing centers of the United States and its territories, shows the activities in Bay City in September 1956.

GLOSSARY OF COMMON AND SCIENTIFIC NAMES OF FISH AND SHELLFISH*

Common name	Other common names	Scientific name
Alewife	Branch herring, big-eyed herring, river herring,	Pomolobus pseudoharengus
	Blueback, glut herring, shad herring	Pomolobus aestivalis
Anchovy		Engraulis mordax
Cod	Codfish	Gadus morhua (Atlantic)
		Gadus macrocephalus (Pacific)
Flounder:		
Gray sole		Glyptocephalus cynoglossus
Lemon sole		Pseudopleuronectes dignabilis
Yellowtail	Dab	Limanda ferruginea
Dab	Sea dab	Hippoglossoides platessoides
Blackback	Winter flounder	Pseudopleuronectes americanus
Fluke	Summer flounder, gulf flounder, flounder	Paralichthys species
'Sole'		Pleuronectidae and Bothidae species
'California halibut'		Paralichthys californicus
Haddock		Melanogrammus aeglefinus
Halibut		Hippoglossus hippoglossus (Atlantic)
		Hippoglossus stenolepis (Pacific)
Herring:		
Lake	Herring	Leucichthys artedi (Great Lakes, except Erie)
Round		Etrumeus sadina
Sea		Clupea harengus (Atlantic)
		Clupea pallasii (Pacific)
Thread		Opisthonema oglinum
Jack mackerel	Horse mackerel	Trachurus symmetricus
Lingcod	Cultus cod, blue cod, buffalo cod, ling	Ophiodon elongatus
Mackerel		Scomber scombrus (Atlantic)
		Pneumatophorus diego (Pacific)
Crab:		
Blue		
Hard	Hard-shelled crab	Callinectes sapidus
Soft and peelers	Soft-shell crab	Callinectes sapidus
Dungeness		Cancer magister
King	Alaska king crab	Paralithodes camtschatica
Rock		Cancer irroratus (New England)
		Cancer species (California)
Stone		Menippe mercenaria
Lobster:		
Northern		Homarus americanus (Atlantic)
		Panulirus argus (Atlantic)
Spiny	Sea crawfish, rock lobster	Panulirus interruptus (Pacific)
Shrimp	Prawn	Penaeus setiferus (South)
		Penaeus duorarum (Atlantic)
		Penaeus aztecus and
		Xiphopeneus kroyeri Gulf)
		Pandalus species (Atlantic and Pacific)
		Pandalopsis species (Pacific)
		Crago species (Pacific)
Menhaden	Mossbunker, pogy, fatback	Brevoortia species
Mullet	Jumping mullet, striped mullet, silver mullet	Mugil species
Ocean perch:		
Atlantic	Rosefish, redfish, red perch	Sebastes marinus
Pacific		Sebastodes alutus
Pilchard	Sardine	Sardinops caerulea
Pollock	Boston bluefish	Pollachius virens
Rockfish	Rock cod, snapper	Sebastodes species (Pacific)
Sablefish	Black cod	Anoplopoma fimbria
Salmon:		
Atlantic		Salmo salar (Atlantic)
Pacific:		
Chinook or king	Tyee, spring	Oncorhynchus tshawytscha
Chum or keta	Fall, dog	Oncorhynchus keta
Pink	Humpback	Oncorhynchus gorbuscha
Red or sockeye	Blueback	Oncorhynchus nerka
Silver or coho		Oncorhynchus kisutch
Spanish mackerel	Mackerel	Scomberomorus maculatus
Tuna and tunalike fishes:		
Albacore	Longfin tuna	Germo alalunga
	---	Thunnus saliens
Bluefin	Horse mackerel	Thunnus thynnus
	---	Thunnus secundodorsalis
Bonito		Sarda sarda (Atlantic)
		Sarda chiliensis (Pacific)
Little	Bonito, albacore, false albacore	Euthynnus alletteratus
Skipjack	Striped tuna	Katsuwonus pelamis
Yellowfin		Neothunnus macropterus
Whiting	Silver hake	Merluccius bilinearis
Clam:		
Cockle		Cardium corbis (Pacific)
Coquina	Pompano shells	Donax variabilis
	Butter	Saxidomus nuttali (Pacific)
Hard	Little neck	Paphia staminea (Pacific)
	Round clam, cherrystone, quahog, little neck	Venus mercenaria (Atlantic)
		Venus mortoni (Florida)
Ocean quahog		Cyprina islandica
Pismo		Tivela stultorum (Pacific)
Razor		Ensis species (Atlantic)
		Siliqua patula (Pacific)
Soft	Soft-shell clam, sand clam, nannynose, maninose	Mya arenaria
Surf	Skimmer	Spisula solidissima
Oyster:		
Eastern	Cove	Crassostrea virginica
Pacific (introduced)	Japanese	Crassostrea gigas
Western	Olympia, native	Ostrea lurida
Scallop:		
Bay		Pecten irradians (Atlantic)
		Pecten aequisulcatus (Pacific)
Sea		Pecten magellanicus

* Taken from Fishery Statistics of the United States 1955. Each species listed was caught in excess of 10,000,000 pounds in 1955.

1.69 THE RELATION OF STOCK DENSITY TO "MILKINESS" OF LEMON SOLE IN UNION BAY, B. C.

Forrester, C. R.
Fisheries Research Board of Canada, Progress Reports of the Pacific Coast Stations, No. 105, 11 (February 1956)

(Abstract of this article appears under 9.15 page 19 - November 1956)

1.69 JELLIED CONDITION IN THE AMERICAN PLAICE HIPPOGLOSSOIDES PLATESSOIDES (FABRICIUS)

Templeman, Wilfred and Andrews, Gertrude L.
Journal of the Fisheries Research Board of Canada 13, 149-182 (March 1956)

(Abstract of this article appears under 2.00 page 3 - November 1956)

3.230 TECHNICAL NOTE NO. 46.--METHOD FOR REMOVING BLOOD FROM HALIBUT TO IMPROVE APPEARANCE OF FROZEN STEAKS

Miyauchi, David T. and Nelson, Richard W.
Commercial Fisheries Review 20, 9-11 (October 1958)

(Abstract of this article appears under 2.3 page 5 - May 1959)

3.230 FISH FREEZING: METHODS AND EQUIPMENT IN COMMERCIAL USE

Slavin, Joseph W. (U. S. Bureau of Commercial Fisheries, East Boston, Massachusetts)
Industrial Refrigeration 137, 18-19, 22-24 (September 1959)

3.231 GROUND HEAT EXCHANGE PROBLEMS

Brown, W. G.
Journal of the Institution of Heating and Ventilating Engineers, pp. 267-275 (Feb. 1958)
Bulletin de L'Institut International du Froid (Paris) 39, 1366 (1959)

Most problems of heat exchange between buildings or buried pipes and tunnels and the ground cannot be solved adequately by simple heat equations because heat usually flows in complicated two- or three-dimensional paths. Rigorous analytical, mathematical equations are not generally available for ground heat exchange, although semiempirical equations of the type developed by Macey are sometimes used for basementless buildings. Semiempirical equations are also available for single-buried insulated pipes, but not for grids of insulated pipes and other complicated arrangements. Numerical relaxation methods can sometimes be used for specific problems in two-dimensional heat flow. When three-dimensional problems are involved, the required calculation time would be prohibitive. Other methods include full-scale field tests and the use of electrical analogues.

3.231 EQUIPMENT FOR THE QUICK FROZEN FOOD INDUSTRY

Ridd, Ivor C.
Food Manufacture 34, 292-294 (July 1959)

This article considers the changes in refrigeration design caused by an ever-increasing demand for high-quality frozen foods.

3.234 BREADING CONTRIBUTES TO THE MICROBIAL POPULATIONS OF FROZEN BREADED FISHERY PRODUCTS

Benarde, Melvin A.
Commercial Fisheries Review 20, 6-10 (March 1958)

(Abstract of this article appears under 3.237 page 7 - August 1958)

3.234 FREEZING OF MEAT AND FISH IN LIQUID NITROGEN

Moiseeva, N. and Piskareva, A.
Kholodil'anya tekhnika (1) 52-55 (1959)

Freezing of meat and fish in liquid nitrogen at -195° C. and storage of frozen meat at this temperature did not affect the solubility of the meat protein. The hydrophilic properties of meat and fish were almost unaffected. The sarcolemma was not affected by cracks appearing between the muscle fibers. The organoleptic properties of the frozen meat and fish were unaffected.

CONVERSION UNITS

1 pound = 453.59 grams
1 ounce = 28.350 grams
1 inch = 2.5400 centimeters
1 gallon = 128 ounces
1 gallon = 231 cubic inches
1 quart = 0.9463 liters
1 ounce = 29.573 milliliters

CONVERSION OF TEMPERATURE SCALES

$F = 9/5\ C + 32$

$C = 5/9\ (F-32)$

SPECIFIC HEAT AND HEAT OF FUSION

Average values of specific heat generally used for fishery products are 0.80 B.t.u. per pound per °F. above freezing and 0.40 B.t.u. per pound per °F. below freezing.

An average heat of fusion generally used for fishery products is 115 B.t.u. per pound. The heat of fusion of ice is 144 B.t.u. per pound.

DEFINITIONS

calorie	heat required to raise the temperature of 1 gram of water 1 degree Centigrade
British thermal unit	252 calories or the heat required to raise the temperature of 1 pound of water 1 degree Fahrenheit
ton of refrigeration	removal of heat at the rate of 12,000 B.t.u. per hour
atmospheric pressure, normal	a pressure at sea level of 14.696 pounds per square inch, absolute
sensible heat	heat added to the body when its temperature is changed
latent heat	heat absorbed or evolved during a change of state, with no change of temperature
heat of fusion	heat absorbed when a solid melts, with no change of temperature
heat of vaporization	heat absorbed when a liquid vaporizes, with no change of temperature
heat of reaction	heat evolved or absorbed during a chemical reaction
heat transmission	flow of heat by conduction, convection, or radiation, singly or in any combination
horsepower	work performed at the rate of 550 foot pounds per second
mechanical equivalent of 1 B.t.u. of heat	heat given off by a total expenditure of 778 foot pounds of energy

COMMON ABBREVIATIONS*

A.	Ångstrom unit(s)
a.c.	alternating current
alc.	alcohol, alcoholic
alk.	alkaline (not alkali)
amp.	ampere(s)
anhyd.	anhydrous
aq.	aqueous
at.	atomic (not atom)
at. wt.	atomic weight
Bé.	Baumé
biol.	biological
B.O.D.	biochemical oxygen demand
b.p.	boiling point
B.t.u.	British thermal unit(s)
cal.	calorie(s)
cc.	cubic centimeter(s)
cm.	centimeter(s)
d.	density (d_{13} specific gravity at 13° referred to water at 4°; d_{20}^{20}, at 20° referred to water at the same temperature)
d.c.	direct current
e.m.f.	electromotive force
Et	ethyl (Et_2O, ethyl ether)
e.v.	electron volt(s)
f.p.	freezing point
ft.	foot, feet
g.	gram(s)
γ	microgram(s)
hr.	hour
in.	inch(es)
kcal.	kilocalorie(s)
kg.	kilogram(s)
kv.	kilovolt(s)
kv.-amp.	kilovolt-ampere(s)
kw.	kilowatt(s)
kw.-hr.	kilowatt-hour
l.	liter(s)
lb.	pound(s)
m.	meter(s); also (followed by a figure denoting temperature) melts at, melting at
M.	molar (as applied to concn.)
ma.	milliampere(s)
Mc.	megacycle
mc.	millicurie
Me	methyl (MeOH, methanol)
meq.	milliequivalent
m.e.v.	million electron volts
mg.	milligram(s)
ml.	milliliter(s)
mm.	millimeter(s)
mγ	millimicrogram
mμ	millimicron(s)
mol.	molecule, molecular
mol. wt.	molecular weight
m.p.	melting point
μ	micron(s)
mv.	millivolt(s)
n	index of refraction (n_D^{20} for 20° and sodium light)
N	normal (as applied to concn.)
petr. ether	petroleum ether
p.p.m.	parts per million
ppt.	precipitate
pptd.	precipitated
pptg.	precipitating
pptn.	precipitation
qual.	qualitative (not qualitatively)
quant.	quantitative (not quantitatively)
r.p.m.	revolutions per minute
sol.	soluble
soln.	solution
sp. gr.	specific gravity
sp. heat	specific heat
sp. vol.	specific volume
sq. cm.	square centimeter(s)
U.S.P.	United States Pharmacopeia
v.	volt(s)
vol.	volume (not volatile)
w.	watt(s)
wt.	weight

* These abbreviations are used by Chemical Abstracts and, accordingly, have wide recognition.

4.12 THE C_{18}- AND C_{22}-POLYENOIC ACIDS OF HERRING OIL

Klenk, E. and Brockerhoff, H. (Univ. Cologne, Ger.)
Chemical Abstracts 52, 13289 (August 10, 1958)

4.12 A QUANTITATIVE EVALUATION OF TWITCHELL'S METHOD FOR THE SEPARATION OF SATURATED AND UNSATURATED FATTY ACIDS

Favarger, P. and Gerlach, J. (Univ. Geneva, Switz.)
Chemical Abstracts 53, 19075h (October 25, 1959)

5.11 CHEMISTRY OF VITAMIN A AND RELATED COMPOUNDS

Heilbron, Ian and Weedon, B. C. L.
Chemical Abstracts 52, 11349 (July 10, 1958)

5.11 BIOCHEMICAL STUDIES ON THE VITAMIN A IN FISH VISCERA. III. THE OXIDATION OF VITAMIN A IN FISH LIVER OILS

Ono, Toyoki and Nagayama, Fumio (Tokyo Univ. Fisheries, Kurihama)
Chemical Abstracts 52, 20705 (November 25, 1958)

6.134 LOSS OF FINES IN CYCLONES

Stander, G. H.
Annual Report, Fishing Industry Research Institute, April-December 1956, Cape Town, South Africa, 10, 22 (1957)

The loss of fines in a cyclone, measured by sampling with a vacuum cleaner, ranged between 0.00175 percent and 0.0025 percent.

6.134 ALTERATION OF MUSCLE PROTEINS OF FISH IN HEAT-TREATMENT

Koval'chuk, G. K.
Chemical Abstracts 52, 18950 (November 10, 1958)

6.32 ENZYME SYSTEMS IN MARINE ALGAE 2. TRANS-α-GLUCOSYLATION BY EXTRACTS OF CLADOPHORA RUPESTRIS

Duncan, W. A. M. and Manners, D. J. (University of Edinburgh, Scotland)
The Biochemical Journal 69, 343-348 (July 1958)

An extract of Cladophora rupestris catalyzed the synthesis of higher oligosaccharides from maltose. The oligosaccharides were separated by charcoal-Celite chromatography and four sugars were characterized by chemical and enzymic methods. They are panose, maltotriose, 6^3-α-glucosylmaltotriose [O-α-D-glucopyranosyl-(1→6)-O-α-D-glucopyranosyl-(1→4)-O-α-D-glucopyranosyl-(1→4)-D-glucopyranose] and maltotetraose. The above and other evidence shows that, with the C. rupestris extract, maltose and maltotriose can function as α-glucosyl acceptors.

6.32 CHEMICAL STUDIES ON MARINE ALGAE XII. THE FREE AMINO ACIDS IN SEVERAL SPECIES OF MARINE ALGAE

Takagi, Mitsuzo and Kuriyama, Mitsuo
Bulletin of the Faculty of Fisheries, Hokkaido University 10, 72-76 (May 1959) (In English)

The distribution of the free amino acids in 75 percent alcoholic extract of four species of marine algae: Ulva, Laminaria, Iridaea, and Porphyra, was determined by quantitative chromatography. The composition of the free amino acids in these marine algae was found to differe markedly according to species.

LIST OF PUBLICATIONS REGULARLY ABSTRACTED

Analyst
Analytical Chemistry
Archives of Biochemistry and Biophysics
ASHRAE Journal (formerly Refrigerating Engineering)
Biochemical Journal
Biochemistry (U.S.S.R.)
Bulletin of the Faculty of Fisheries, Hokkaido University
Bulletin of the Japanese Society of Scientific Fisheries
California Fish and Game
Canadian Fisherman
Canadian Journal of Biochemistry and Physiology
Canadian Journal of Chemical Engineering
Canadian Journal of Chemistry
Chemical Abstracts
Chemical and Engineering News
Chemical Engineering
Chemical Processing
Chemistry and Industry
Commercial Fisheries Review
Drug and Cosmestic Industry
Federation Proceedings
Feed Bag
Feedstuffs
Fish Meal
Fisheries Newsletter (Australia)
Fish. Res. Bd. Can., Prog. Repts. Atlantic Coast Stas.
Fish Res. Bd. Can., Prog. Repts. Pacific Coast Stas.
Fishing Gazette
Food Engineering
Food Manufacture
Food Preservation Quarterly
Food Processing
Food Research
Food Technology
Frosted Food Field
Industrial and Engineering Chemistry
Industrial Refrigeration
Journal of Agricultural and Food Chemistry
Journal of Applied Chemistry
Journal of Biological Chemistry
Journal of Nutrition
Journal of the American Chemical Society
Journal of the American Dietetic Association
Journal of the American Oil Chemists' Society
Journal of the Association of Official Agricultural Chemists
Journal of the Fisheries Research Board of Canada
Journal of the Science of Food and Agriculture
Maine Coast Fisherman
Modern Packaging
Modern Refrigeration
National Fisherman
National Provisioner
Nature
Nutrition Reviews
Pacific Fisherman
Poultry Science
Progressive Fish-Culturist
Quick Frozen Foods
Report of the Food Investigation Board (Great Britain)
Science
Seafood Merchandising
Trade News (Fisheries Department, Canada)
Western Canner/Packer
Western Fisheries
World Fisheries Abstracts
World Fishing

Articles chosen for abstracting or inclusion as bibliographical references are those deemed of interest to the commercial fisheries and to fishery technological laboratories. Occasionally pertinent articles from sources other than the above-listed publications are included. Biological papers are generally omitted.

7.522 THE COLORIMETRIC NINHYDRIN METHOD FOR THE DETERMINATION OF AMINO ACIDS. SOME EXAMINATIONS FOR YEMM AND COCKING'S METHOD

Suyama, Michizo and Konosu, Shoji
Bulletin of the Japanese Society of Scientific Fisheries 23, No. 9, 555-560 (1958) (English abstract, figures, and tables)

Maximum color is obtained by heating immediately after the addition of the reagents. Blank values are not independent of the aging of the reagent mixture, therefore the reagent was prepared the day before use.

7.522 AMINO ACID ANALYSIS BY HORIZONTAL PAPER CHROMATOGRAPHY

Chartier, Jacqueline; Van Klaveren, F. W.; and Vaillancourt, G. (Fisheries Research Board of Canada, Technological Station, Grande-Riviere, Quebec, Canada)
Journal of Chromatography 1, 317-326 (1958)
Studies 1958, from the Stations of the Fisheries Research Board of Canada, FRB 531 (1959) (Ottawa)

Various modifications of the circular paper chromatographic method for the quantitative determination of amino acids in protein hydrolyzates have been investigated. With the solvent mixture n-butanol-2-butanone-water-ammonia (5 : 3 : 1 : 1), six groups are obtained. With the solvent mixture, lutidine-water, two groups are separated into their individual components; with the solvent mixture, tertiary butanol-formic acid-water (75 : 0.8 : 24.2), three groups are separated. Threonine appears as a single band. The length of the run is increased and separation is improved by dividing the paper into triangular segments and by putting the starting point near the periphery.

7.610 DISTRIBUTION CHROMATOGRAPHY OF VITAMIN A AND OTHER FAT-SOLUBLE VITAMINS WITH REVERSAL OF PHASES

Wiss, O. and Gloor, U. (F. Hoffmann-La Roche and Co., A. G. Basel, Switzerland)
Chemical Abstracts 52, 14091 (August 25, 1958)

7.610 NOMOGRAMS FOR CALCULATING AND TESTING THE MORTON AND STUBBS CORRECTION IN THE SPECTROPHOTOMETRIC ASSAY OF VITAMIN A

Pancrazio, G. and Duse, V. (Research Laboratory, ORMA, Istituto Terapeutico, Romano, Rome)
The Analyst 83, 579-584 (October 1959)

Two nomograms (for vitamin-A alcohol in isopropyl alcohol and for vitamin-A acetate in absolute ethanol) are given for the rapid application of the Morton and Stubbs correction without numerical calculation. The Morton and Stubbs correction sometimes leads to erroneous results, and a practical test for the reliability of absorbancy corrected is proposed. The test can be carried out in a few minutes by using nomograms, and makes it possible to ascertain whether or not the irrelevant absorption is approximately linear over the wave length range between the two fixation points at six-sevenths.

7.8 SOME STATISTICAL CONSIDERATIONS FOR SMALL SAMPLE EVALUATION IN TRIANGULAR TASTE TESTS

Roberts, H. R.; McCall, C. H., Jr.; Thomas, R. E. (The George Washington University, Washington, D. C.)
Food Research 23, 388-395 (July-August 1958)

7.8 POST-MORTEM LENS TURBIDITY AS AN OBJECTIVE MEANS OF MEASURING THE FRESHNESS OF SEAFISH

Wittfogel, H. (Municipal Vet. Research Div., Cuxhaven, Ger.)
Chemical Abstracts 53, 15412c (August 25, 1959)

7.81 CARBONYL COMPOUNDS IN FISH AS RELATED TO THE DETERIORATION I. DETECTION OF VOLATILE CARBONYL COMPOUNDS FORMED IN FISH FLESH

Ota, Fuyuo
Bulletin of the Japanese Society of Scientific Fisheries 24, No. 5, 334-337 (1958) (English abstract, tables, and figure)

A simplified method for estimating volatile carbonyl compounds in fish is presented. This method gave good results in the recoveries of volatile acids added to fish flesh and to the steam-distillate from fish flesh. In fresh fish, volatile carbonyl compounds increased with the length of time in storage, and tended to decrease in the stage of advanced spoilage. By a modified paper chromatographic method, the formation of acetaldehyde, butylaldehyde and acetone in fish flesh during storage was demonstrated.

II. Thermal production of formaldehyde in fish flesh. --Ibid. 338-341. Heating with steam under pressure produced a measurable amount of formaldehyde and a considerable amount of dimethylamine, which was almost proportional to the trimethylamine oxide content of the flesh. Thermal breakdown of trimethylamine oxide was accelerated by the presence of fish extracts or by certain kinds of amino acids.

7.81 DETECTION OF AMINES PRODUCED ON IRRADIATION OF BEEF

Burks, Robert E., Jr.; Baker, Evelyn B.; Clark, Patricia; Esslinger, Jeanette; and Lacey, James C., Jr.
Journal of Agricultural and Food Chemistry 7, 778 (November 1959)

(Abstract of the article appears under 3.19 page 5 - April 1960)

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8.64 VITAMIN B_1 IN FOODS. I. VITAMIN B_1 CONTENT IN EYEBALLS OF FISHES FROM PROVINCES OF TOSA

Fukuda, Shunji and Hirami, Yoshihiko (Kochi Women's Coll.)
Chemical Abstracts 52, 20749i (November 25, 1958)

8.64 B VITAMINS CONTENT OF LIVER MEAL AND LIVER EXTRACTS OF AQUATIC ANIMALS

Miyagawa, Shoji and Ueno, Kojiro
Bulletin of the Japanese Society of Scientific Fisheries 24, No. 4, 296-299 (1958) (English abstract and tables)

The meal of fin whale showed higher values of vitamin B_2, niacin, and folic acid and lower values of vitamin B_{12} than other meals tested. The meal of yellowfin tuna, on the other hand, contained a very notable amount of vitamin B_{12} but was poorest in vitamin B_2 and niacin content.

8.64 VITAMINS AND THE REPRODUCTIVE CYCLE OF OVARIES IN COD (GADUS MORRHUA)

Braekkan, Olaf R. (Bergen, Norway)
Fiskeridirekt. Skrifter Ser. Teknol. Undersøk. 3, No. 7, 1-19 (1958)

Pantothenic acid was high (up to 2,430 μg. per gram dry weight) in ovaries of juvenile cod, but it was markedly less in mature individuals. Vitamin B_{12} showed a definite, though slight decrease with maturity. Riboflavin, niacin, biotin, protein, ash, and water remained constant.

8.7 STUDIES ON THE COMPLETE UTILIZATION OF SQUID (OMMASTREPHES SLOANI PACIFICUS) XVI. ON THE MANUFACTURE OF DRIED SQUID MEAT (8) AMINES PRODUCED IN DRIED SQUID MEAT

Tanikawa, Eiichi and Motohiro, Terushige
Bulletin of the Faculty of Fisheries, Hokkaido University 9, 73-80 (May 1958) (English abstract, figures, and tables)

8.7 SANITATION AND PROCESSING OPERATIONS

Anonymous
Canadian Fisherman 46, 21-28 (October 1959)

(Abstract of this article appears under 2.3 page 5 - February 1960)

9.17 CLIMATIC TEMPERATURE CHANGES AND COMMERCIAL YIELDS OF SOME MARINE FISHERIES

Bell, F. Heward and Pruter, Alonzo T. (International Pacific Halibut Commission, Seattle, Washington)
Journal of the Fisheries Research Board of Canada 15, 625-683 (July 1958)

A review of the literature suggests need for re-examination of the bases for some reported climatic temperature-fish productivity relationships. In some instances adequate provision does not appear to have been made for changes in the amount of fishing, in economic conditions, or in the efficiency of the fishing fleets. Possible fortuitous relationships should be avoided by exhaustive tests of the representativeness of both the temperature and fishery data.

9.17 STUDIES ON THE SHOALING BEHAVIOR OF FISH I. RESPONSES OF TWO SPECIES TO CHANGES IN ILLUMINATION AND TO OLFACTORY STIMULI

Steven, D. M. (Univ. Coll. West Indies, Jamaica)
Chemical Abstracts 54, 766a (January 10, 1960)

9.2 YEARBOOK OF FISHERY STATISTICS - 1955-56

Anonymous
FAO, Yearbook of Fishery Statistics - 1955-56, 6, (1957) (Rome, Italy)

9.2 YEARBOOK OF FISHERY STATISTICS (1957) INTERNATIONAL TRADE

Gertanbach, L. P. D.
FAO, Yearbook 1957, 8, (1959) (Rome, Italy)

(Abstract of this article appears under 9.6 page 15 - February 1960)

9.2 FROZEN PROCESSED FISH AND SHELLFISH CONSUMPTION IN INSTITUTIONS AND PUBLIC EATING PLACES--LOS ANGELES, CALIFORNIA

Anonymous
Circular 72, 60 pp. (November 1959) (U. S. Department of the Interior, Bureau of Commercial Fisheries, Washington 25, D. C.)

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